

POPULAR MECHANICS MAGAZINE

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BOMBER CARRIES
JET FIGHTERS
PAGE 112



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Typical example: user's experience with B. F. Goodrich tires

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H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

WHEN a Californian lets loose a few superlatives on a region outside his home state—that's news. For proof of this, turn to our western editor's account of America's "last frontier" on page 132.

EVER have a piece of what looks like junk breeze past you on the highway at 80 m.p.h.? The probable explanation for this phenomenon is revealed on page 114.

NEXT MONTH we'll take you for an exhilarating sailboat ride on the world's fastest catamaran. The story comes from Honolulu. Another July feature may start a "gold" rush. There's a district near San Diego, Calif., where one farmer grossed \$2300 an acre raising celery! Look for "Pay Dirt in Chula Vista."

WHAT'S MORE refreshing on a hot day than a dip in a pool? A story in the Craftsman section next month tells how to build your own, whether you want a wading pool for the small fry or an ornate pool for a formal garden.

THE SIZE of your pocketbook need not prevent you from satisfying a yen to be a member of a Yacht Club. Next month an amateur yachtsman tells how you can learn to sail small boats, and start your own club inexpensively.

EVER GET stuck for a tow bill when your car quit on the road? An article in July will help you do your own trouble shooting next time you're in difficulty miles from a garage.

IN THE July Shop Notes section, an experienced machinist explains the intricacies of taper turning in a lathe. Three common methods of doing this work are explained.

RADIO beginners will find an easy-to-build 1-tube a.c.-d.c. loudspeaker set in the Radio and Electronics section next month.

Volume 89 JUNE 1948 Number 6

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How'll you have your snow?



Deep or shallow? Crisp or damp? Falling straight down or angling in at 80 miles an hour?

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Here's the recipe for snow. In a chamber the size of a 4-room house, they yank the temperature down to minus 40 with huge ammonia compressors powered electrically with 700 horsepower. Then they shoot in saturated steam which quickly turns to fog and drops

to the freezing point where it forms a super-cooled cloud. At 5 or 10 degrees above zero, Signal Corps engineers induce nucleation by shaking a thimble-size bag of dry ice. When the cloud gets down to minus 40, the water vapor crystallizes into billions of snow crystals which fall to the floor or can be blown about with a high-speed propeller.

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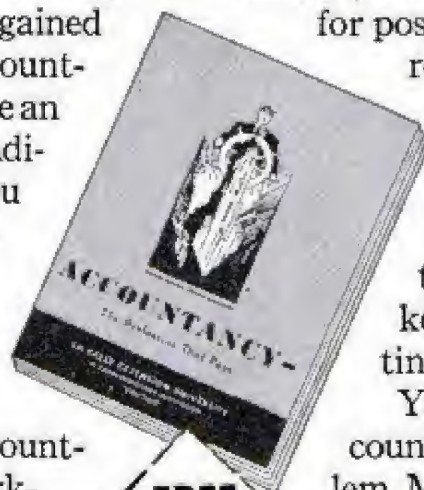
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ELECTRICAL

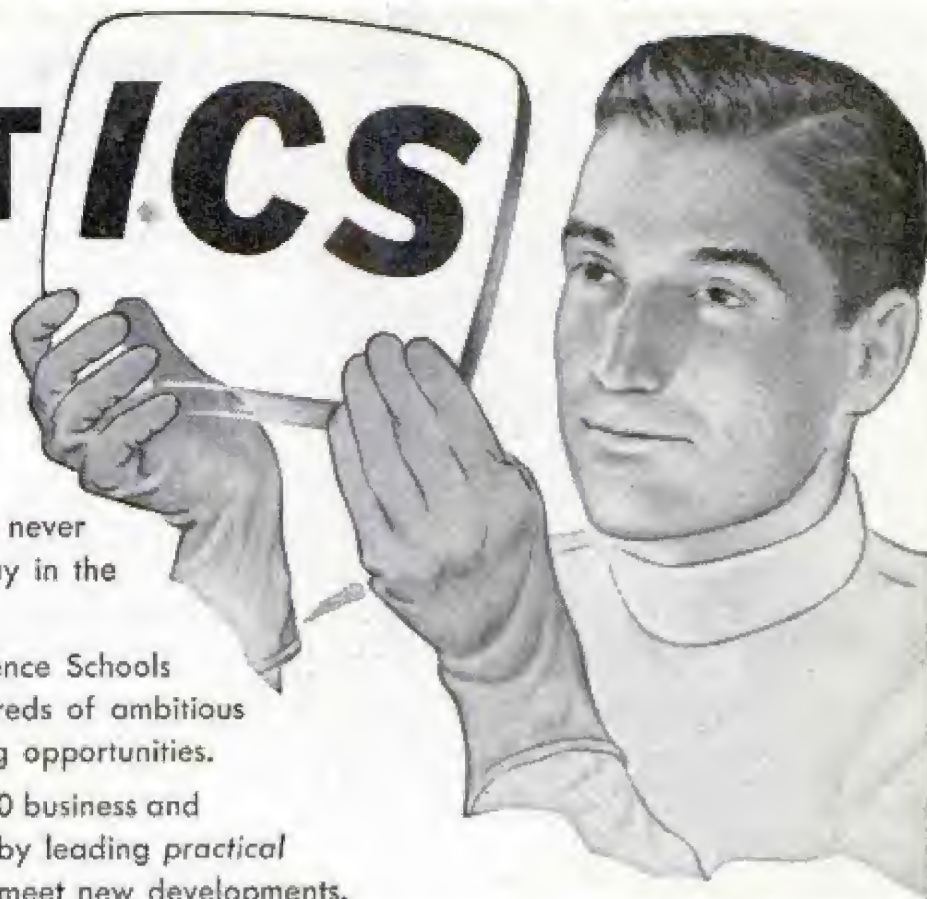
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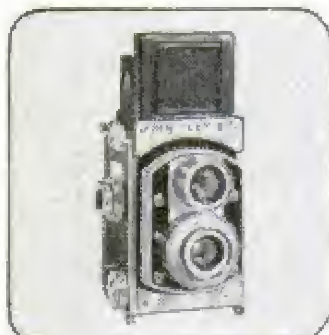
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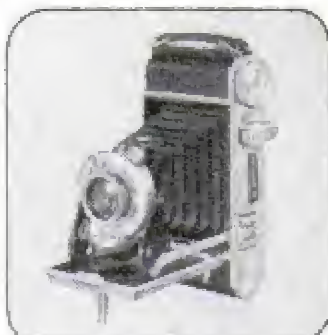
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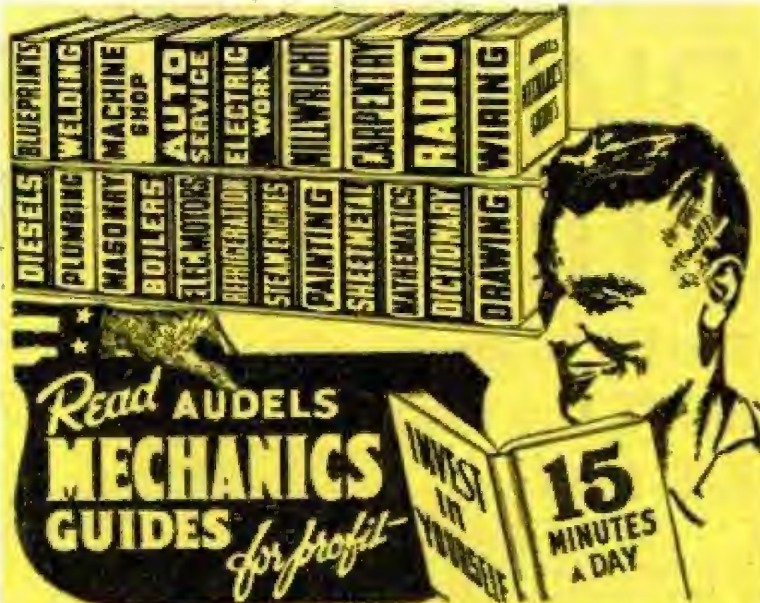
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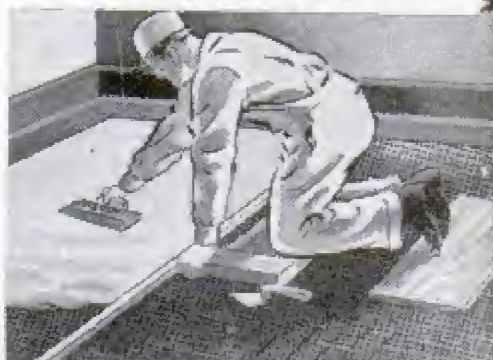
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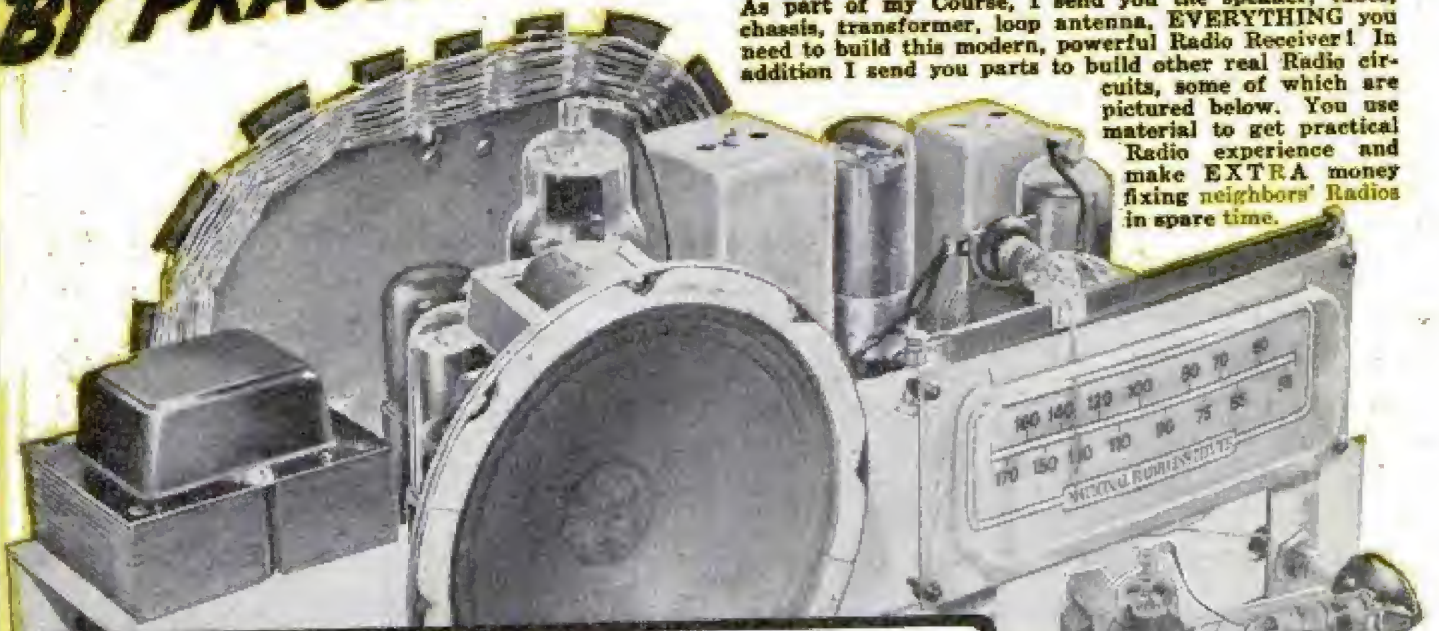
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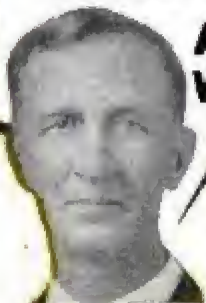
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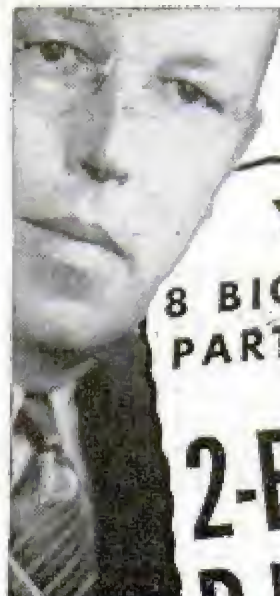
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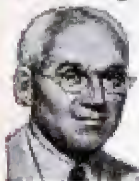
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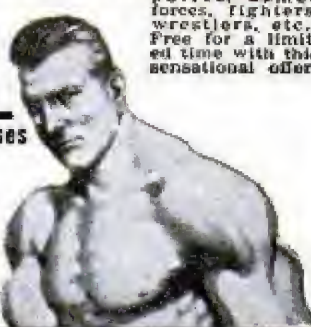
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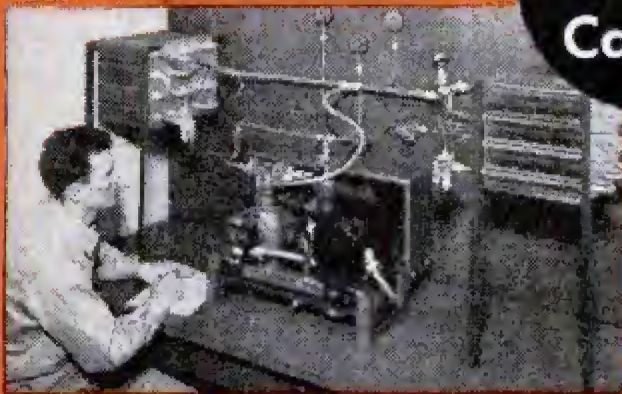
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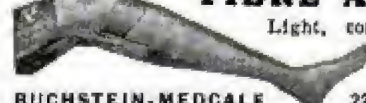
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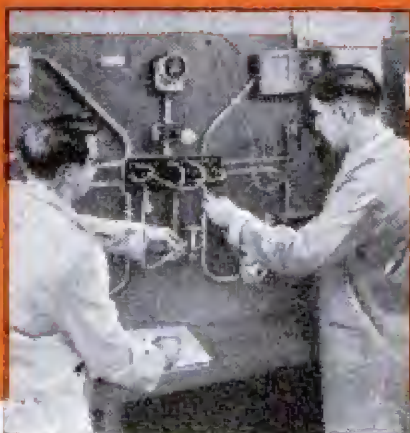
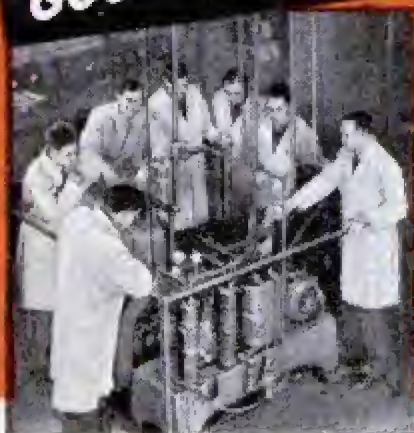
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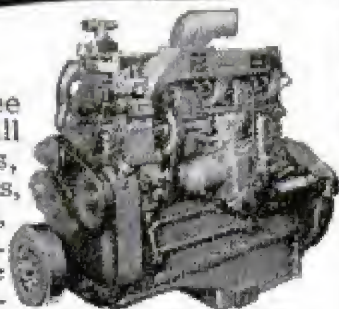
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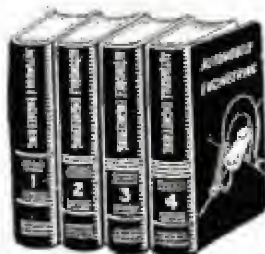
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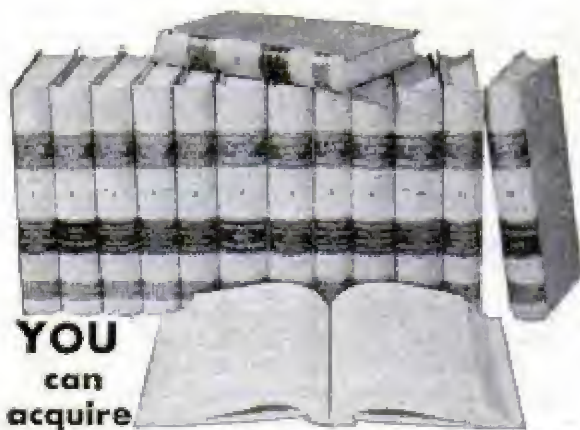
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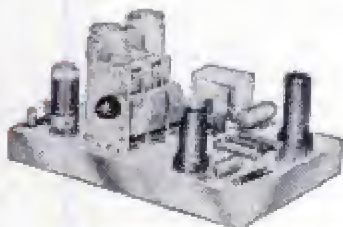
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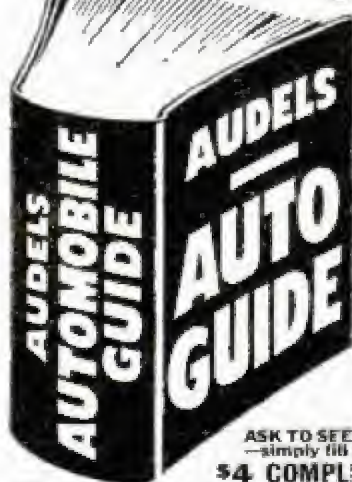
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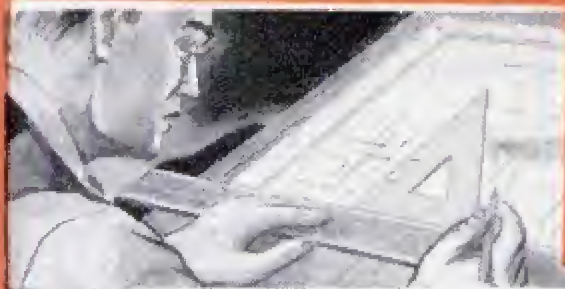


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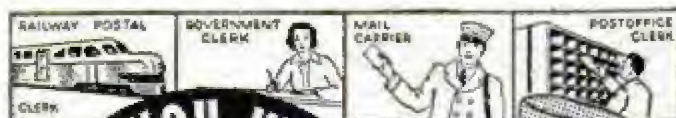
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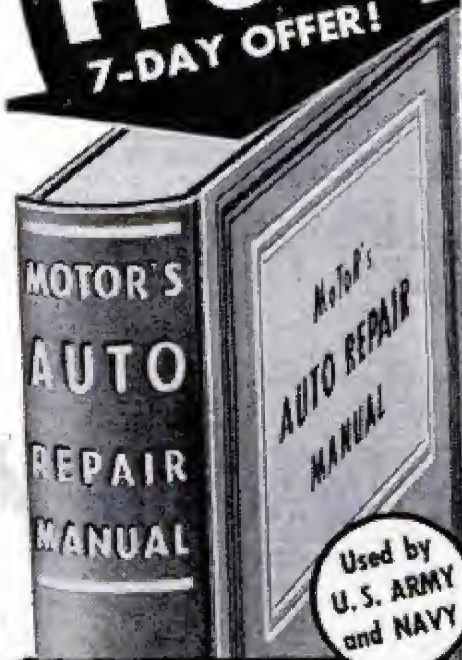
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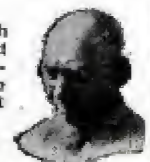


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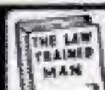
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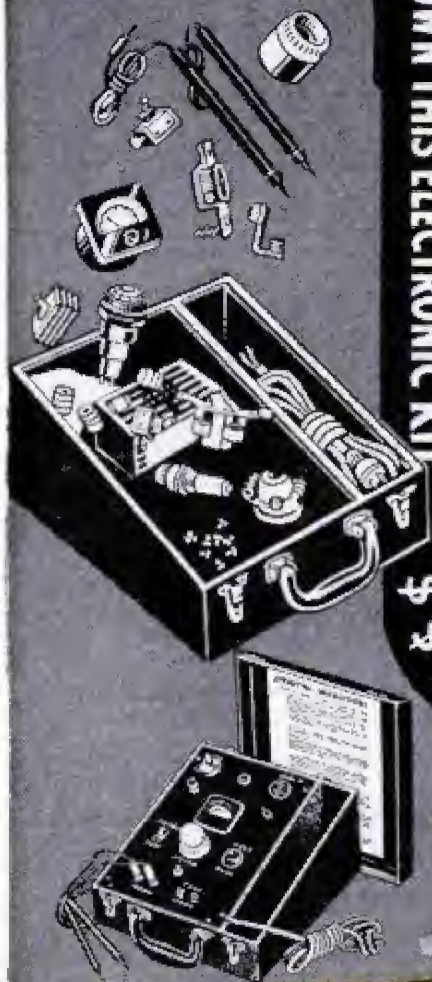
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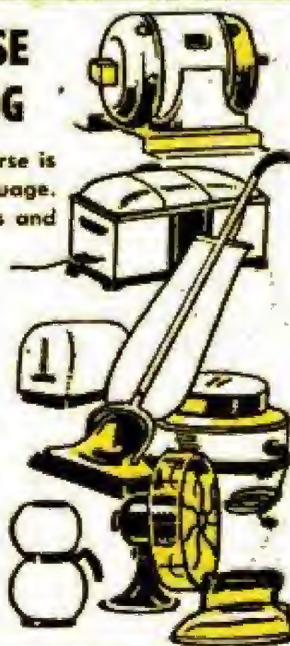


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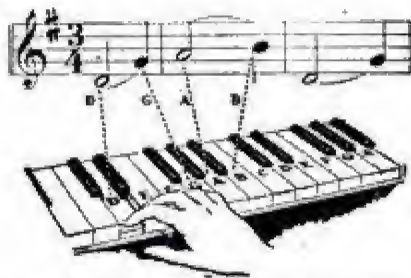
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WHOLESALE Source 100,000 items 10c. Wilborn, 316-P Judson Rives Bldg., Los Angeles 13.

BUILD Your own mail order business! Noted specialist's 10,000-word treatise shows, step by step, how to make it pay on small capital start. 25c, satisfaction guaranteed. Edmonson, 1327 Miller Reed, SE, Atlanta, Ga.

MAILORDER Offers increased income! Free details. Cox, 14 Church, Saugus 10, Massachusetts.

MAKE \$5,000 Yearly "cashing in on fluorescent lighting." Start profitable maintenance and fixture fix-it business without capital. Make beautiful lights (complete) for 50c each and less. Hurry for amazing illustrated literature and sensational free gift offer. Willis Service, 101 York Street, Brooklyn 1, New York, Dept. C.

HANDY Men—Make quick, easy profits repairing leaking water faucets with Economy Renewable Seat Tools. Build valuable sales and service business in your spare time. Territories open, literature free. See our display ad this issue. Economy, 3122 N. California, Chicago 18.

LEARN To publicize yourself for increased income and rapid advancement. Details free. Publicity Systems, Box 322-A, Jacksonville, Illinois.

"YOUR Own boss with a guaranteed regular income" is free booklet explaining how you easily earn \$500 to \$1000 monthly year after year. Write: Auditax System, 4513-A Sunset, Los Angeles 27.

FLOCK, Flock adhesive, liquid rubber, moulding compound, plaster hardener—samples, each 25c, all \$1.00. Kalamazoo Mail Order, 705 Barney Road, Kalamazoo 84, Michigan.

NEW Liquid plastic. Earns money for you at home. Make plastic containers for the drug and cosmetic trade. Terrific demand. You make them, we sell them. You can earn a minimum of \$50.00 per week at home. No machinery or experience required. We supply raw materials and instructions; or you can come to our laboratories and receive personal instruction and contract. Write for full details. Travaco Laboratories, P.O. Box 1883, Boston 5, Mass.

BE A used car dealer, guaranteed plan \$1.00. Edw. Smith, 17A Rockland, Yonkers, N. Y.

WATCHES. Wholesale: Rebuilt Elgins, Walthams, Bulovas, etc., new and used railroad, diamond, rhinestone, lapel, \$9.50 up. Catalogue free. Brookings, B-D1975, Little Rock, Ark.

MAKE Profits in mail order business. Astounding plans describing method sent free. Jinton Service, Lock Box 1373P Mobile 8, Ala.

ELECTRIC Pencil—Writes, engraves all metals. 110 volts. \$2.95 postpaid. Reb Industries, Elmhurst 2, Illinois.

BIG-PAYING Home mailorder business! Write immediately. Jackson, Newfoundland, Kentucky.

LOOKING For a profitable sideline? Metalize baby shoes! Good profits, small investment. Easy work. Free details. Joseph B. Kushner, Metal Finishing Engineer, Stroudsburg 8, Pennsylvania.

MAKE Beautiful vari-colored, highly glazed concrete pottery. Amazing profits. Small capital starts. Write for samples and photographs. Ozark Enterprises, Lock Box 273, St. Charles, Mo.

LIQUID Marble—Make in any color. Soundproof plastic flooring. Flexible molds. Cast novelties, plaques, statuary. Big money—your own business. Catalog free. Write — Bing Products, 88-A6A Broad Street, Boston 10, Mass.

AMAZING Mail profits! Produce selling letters, circulars, with Roll-O-Press, 5000 per hour automatically. Only \$32.50. Free literature. United Technical Laboratories, Morristown 11, N. J.

ELECTROPLATING Booklet tells how to start your own business or work for others at big pay. Learn at home in spare time. Send postcard for free copy today. Hyde School of Electroplating, Room 531, 432 F Street, San Diego 1, California.

MONEY For you in your own business. Many surprising opportunities. Free information. Empire, Box 1340-C, St. Louis, Mo.

MOLD Makers. Genuine natural latex for rubber molds, only two coats needed for thick mold. Reproduce statuary, plaques. Inexpensive. Write Major Chemical Co., 131A Inman Street, Cambridge 39, Mass.

FOR More business, operate an individual business office, exclusively under your name. Rates, \$12.00 and \$18.00 yearly. Co-operative Office Service, 126 Lexington Avenue, New York 16.

INVENTIONS Protected in 30 days. Patents for sale. Patent News, 12M, Washington, D. C.

\$100 BUYS Ten year license to sell copyrighted mailorder article. Make full profit ten years. Free particulars. Robert J. Drummond, 33 North St., Stoneham 80, Mass.

MAKE Money at home like I do. Write immediately. **Duffy, Covington, Ky.**

BRONZED Baby shoe mountings and supplies. All metal bronze bookends, picture frames, ash trays, etc. Onyx ash trays, desk sets, plaques. Hardening solution, 30-amp. plating rectifiers with powerstat control, \$85.00. Geared motors for agitation \$20.00. Lead lined tanks. Write for list. **Hollywood Bronze Supply, 1770 N. Vermont, Hollywood 27, Calif.**

NEW Proven business. Only expense advertising. Clean, light, pleasant work. Full instructions \$3.00. **Germaine, 1450 E. 19th Ave., Columbus 11, Ohio.**

AMAZE Others. Add columns instantly. Add faster than adding machine. Free details. **P. Math Institute, Box 463, Nashville 2, Tenn.**

SELL Greeting cards, pictures, signs, novelties, books! Large profits! Catalog free! **Ellico, 434 North Wells Street, Chicago 10.**

MAKE Money making new greaseless doughnuts at home on electric machine. Wholesale to grocers, drug stores, cafes, hamburger shops. Send for free recipes and plans. **M. Ray Company, 3605 South 15 Ave., Minneapolis 7, Minnesota.**

FIREWORKS Wholesale. Sample parcel \$0.10c. Packages of 16 (1230 firecrackers) \$3.00. No C.O.D.'s. Dealers wanted. **Crawfords Fireworks, St. Helens, Oregon.**

YOUR Own business in plastics. Details free. **Harco, Edgewood, Maryland.**

ADVERTISE Your business — 5,000 6x9 circulars \$14.00 postpaid. **Journal Printing Co., Newark, Ark.**

HELP Wanted to operate our successful mail business. Free details. **Reynolds, Box 103Y, McAlisterville, Penna.**

START Business! "with \$1.00." Money-maker! Free sample! **Stephens, Grand Junction, Colorado.**

FREE Details — "200 profitable" mail order opportunities. **Wayne Burger, Baltic, Ohio.**

LEARN Auctioneering by mail. Sample lesson free. **Nelson Auction School, Renville, Minnesota.**

A FACTORY In your home garage! Mfg. and sales rights, mechanics' waterless hand cleaner. \$500-\$600 monthly. No special equipment necessary. **Western Aircraft Mfg., Dept. D, Los Angeles 6, Calif.**

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MAKE Perfumes. Big money. Write **Macias, 1207-13th Avenue, Tampa, Florida.**

INCORPORATE Your business. Free details. **Tax Research Bureau, Inc., Delaware Trust Building, Wilmington, Delaware.**

MAKE Liquid marble, artificial marble flooring, flexible molds, statuary, art goods, novelties. Literature free. **Kemico, Park Ridge 50, Ill.**

TEN Money-making home business opportunities. Details, 25c. **Crawford, Box 1161-PM, Bridgeport, Conn.**

EARN \$200 Weekly installing new amazing "Styron" plastic wall tile in homes, offices. Easily applied. Tile your own kitchen, bathroom, too. Instructions, everything furnished. Literature free. **U. S. Tile Co., 30 W. Washington St., Chicago 2, Ill.**

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UNPAINTED Bookends, plaques, statues, figurines. List. **Haverty Products, 1219 8th Ave., Altoona, Penna.**

INCOME From local information. No selling. **Neber Co., LaVerne, Calif.**

PRIVATE Label service. Complete line cosmetics, flavorings, specialties. You furnish labels, we label, or will ship unlabeled and you label. Can supply complete line labeled our Victor's label. Also big line flavor concentrates and flavor ingredients. **Hindman Products, Inc., 917-200 College Avenue, Morgantown, W. Va.**

MAKE Money by mail, every month. Spare time business. Small capital required. **Tuff, 429 Robison Ct., Pittsburgh 19, Penna.**

YOUR Opportunity to become independent. In a profitable mail order business of your own. Details free. **Yaniv Distributors & Publishers, Box 2453, Youngstown, Ohio.**

BABY Shoes preserved. Formulas, instructions \$1.00. **Reilly, 5432 Malcolm St., Philadelphia, Penna.**

NEW Low prices. Complete line cosmetics, flavorings, specialties. Distributors, jobbers, agents wanted. **Victor's Products Company, 917-201 College Avenue, Morgantown, W. Va.**

GET \$1.25 Guaranteed fire extinguishers. **Scheall, Box 225X, Duluth, Minnesota.**

START Real estate business. America's finest profession spare time. Details free. **Educational Book Co., 2907 Berwick Ave., Baltimore 14, Md.**

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EASY \$500 Month profits. Men or women. Your own distributing business. Not house to house. Nationally distributed, fast selling line cosmetics, flavorings, specialties. Sales or business experience desirable. High school or equal education. Car and extensive traveling required. New, profitable, proven sales plan by telephone. Investment secured by merchandise required, or credit arranged. **Victor's Products Company, 917-202 College Avenue, Morgantown, W. Va.**

QUICK Money. "Repairing car batteries." At home! Easy too! **Batteryman, Grand Junction, Colorado.**

WANTED Unused U. S. postage stamps, small discount. **Advance Stamp Company, 24 East 23rd Street, New York.**

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FOR An extremely profitable lifetime business operate a collection agency; credit bureau. Easily learned. Free folder. **Cole & Associates, Syracuse 2, N. Y.**

GOLDEN Opportunity "How to Establish and Operate a Successful Mail Order Business." Free information. **Palmer Publications, 4219-A Southwest Marigold, Portland 1, Oregon.**

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AGENT Or exclusive distributor for cigarette lighter mfg. **MacGregor, Tahoe Valley 16, Calif.**

OWN—Operate ball gum, nut, cigarette vending machines. Amazing profits, no selling. Write for free details. **Cameo Vending, Dept. P, 432 West 42nd, New York.**

METALLIZE Baby shoes. Excellent profits. New system assures success. Free details. **Treasures Forever, 89 Henry Ave., Lynn, Mass.**

BELTS! Make 'em and make money. No tools! Sample 50c. **Artine Leather, 411 Joseph Ave., Rochester 5, N. Y.**

BABY Shoes preserved. Formulas, instructions \$1.00. Supplies and bases. **Novelty Bronzing, Box 56, Hyde Park 36, Mass.**

START Home business making statuettes, plaques, artificial marble flooring, liquid marble, flexible molds, metallizing baby shoes. Amazing profits. Folder free. **Creative, 236-L, Winnetka, Illinois.**

MAKE Flexible molds! Few cents each! Cast plaques, novelties, bookends! Free samples! **H. Tooker, Hamilton 44, Ohio.**

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POPCORN Machines. Potato chip outfits. **Long Eakins Company, 4860 Hi Street, Springfield 99, Ohio.**

OPERATE Profitable mail order business. Splendid opportunity. For details write **V. M. McKinley, 76 Ave. "A," Battle Creek, Mich.**

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\$46 FROM Square foot plywood. Jigsaw necessary. Write. **Woodarts, X-38, Bridgewater, Mass.**

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RE-NEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called **Leather-New**. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of **Leather-New** covered material and complete deal. **4723A Troost, Kansas City, Missouri.**

EXTRA Money? Free details. **Trable, 1016 1/2 Elm Street, Dallas, Texas.**

MAKE Perfume. Complete outfit \$7.50. Information free. **Walter Lawson, 21 Joiner, Saint Augustine, Florida.**

LEARN Piano tuning, repairing, at home. Tremendous field! Piano parts, tools furnished. Established 1935. **Empire School of Piano Tuning, 606-B East University Ave., Champaign, Ill.**

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MAKE Money casting new 1948 metal toys and novelties. Latest scale model autos, original ashtrays, savings banks, water pistols, etc. Enormous wholesale and chain store demand keeps manufacturers busy. Spare or full time. No experience or special place necessary. Write for details and illustrations of patterns needed. **Metal Cast Products Co., Dept. A, 1696 Boston Road, New York 60, N. Y.**

MAIL Order businesses bought, sold, brokered. Write for free bulletin of exclusive opportunities. **Turnipseed, Inc., Box 681, St. Louis, Mo.**

START Home plaster novelty business. Amazing course tells how. Literature free. **Kemo-Courses, 4862 Catalpa, Chicago 30, Ill.**

COLORGLAZED Concrete pottery made without molds. Patented method. Cemetery products, novelties, tiles. Basement leak-sealing. Money-making projects. Booklet, details free. Men only. **National Potteries Company, Grand Rapids, Minnesota.**

START Mailorder bookshop—Everything furnished. 25c brings booklet, samples, exciting ideas. **General Publications, Ossining, N. Y.**

LIQUID Rubber for making flexible molds. Cast novelties. Sample bottle 25c. Free literature. **Chaney, 1130 E. 16th St., Jacksonville 6, Fla.**

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OPERATE Profitable home business selling merchandise by mail. Fast sellers. Large profits. **Powell Service, 5713 Euclid, Cleveland 3, Ohio.**

SPECIALTY Manufacturing, the big money business that can be operated anywhere, start on a very small capital; we supply dependable formulas and complete instructions; get interesting free booklet, "Money-making Opportunities in Specialty Manufacturing." **Howard Robinson, Ph.G., 1300-A South Ohio Street, Sedalia, Mo.**

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\$25 WEEKLY Working two hours daily. No canvassing. No manufacturing. **Lycke, Box 2471, Cleveland 12, Ohio.**

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MAILING Postcards selling repeat merchandise is profitable. Everything supplied. Details free. **Gordan Publishers, Box 23, Pawtucket, R. I.**

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WHITE Liquid rubber for making flexible molds! Quick drying! Safe! For home, classroom, or industry! Quart \$2.00. Gallon \$5.95. Full instructions! Beginner's booklet on molding and plaster casting 25c. Free with order! **Plastercraft Supply Company, 1406 East 43rd Street, Cleveland 3, Ohio.**

MAIL Order opportunities. Full or spare time. Hundreds of chances. No charge. Postal brings copy. **Blackstone Press, Somerville, New Jersey.**

MACHINES Available for making new designs of interlocking concrete building blocks. **Delaware Industries, Dept. 11, Muncie, Indiana.**

START Plating business at home. Amazing profits. Make own outfit. Inexpensive. Illustrated instruction booklet 25c. **Popular Mechanics Press, (C-43), 200 E. Ontario, Chicago.**

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START Your own business on our capital. Always your own boss. Hundreds average \$6,000 to \$25,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary to start. Wonderful opportunity to own pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. F-U-PPM, Freeport, Ill.

SEA Shells. Interested in making shell jewelry, lamps, novelties. We have all supplies at wholesale. Write for price list. Sea Shells, 269 W. Flagler Street, Miami, Fla.

CO-OPERATIVE Publishing pays! Co-publish "Progressive" for profits, prestige, independence! Complete instructions, 25c. Kimball, 31-P Norway, Berlin, N. H.

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HOW To make money at home spare time. P. O. Box 8357, Chicago.

EARN Up to \$520 month part or full time keeping books for small firms. Simplified system. Write Tax-Saver System, Dept. S, Ft. Worth, Texas.

DOLLARS For spare time. Complete instructions \$1.00. Hasco, 119 Ravine, Matawan, New Jersey.

24 MONEY Makers and formulas—25c. Blickenderfer, Cloverleaf, Verona, Penna.

PUT Your wife in business! Sell home decorations. 200% profit, everyone buys, no investment. Campet Company, 126 N. Springfield, Chicago, Ill.

CONDUCT Profitable mailorder business. Sell books. Dealers wanted. Extra! Publish your own. 25c brings booklet, exciting details. Graphic Publications, Manchester, N. H.

HOME Spare time work mailing magazines. Instructions, sample magazine. 25c. DePalma Service, R.D. 3, Middletown, N. Y.

"HOW I Made Fortune Raising Frogs"—New book \$1.00. Satisfaction guaranteed. Marlboro, 1035 Marlborough, Detroit 15, Michigan.

UNPAINTED Plaster ornaments. Beautiful designs easily decorated with water colors or oil paints. Profit or hobby. Illustrated list free. Midwest Novelty Mfrs., 108-A Cedar Street, Anaconda, Montana.

CONCRETE Block molds, 8x16x4 \$6.70, others, literature free. Lehnert, Norwood 2, N. J.

RUBBER Stamps. Sell locally or by mail. Stamp brings details. Carb, 2739-R Magnolia, Chicago 14, Ill.

SCOOP! \$3 Hourly with my "Specialty Repair Kit." Revolutionary idea. Write Bob Cooper, East 2324 Joseph, Spokane 14, Washington.

PROFITABLE Money-making information plus 64 page mailorder magazine 10c. Crown Company, 507-C Fifth Ave., New York City.

REPAIR Leaking faucets easily with our repairing kit. Write for details. Great Lakes Metal Specialty Mfg. Co., 1450W North Ave., Chicago 22, Ill.

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MAIL Beginners! Free information guide. Leese, 4718 North Laverne, Chicago 30.

START Your own business! Big money manufacturing novelties, plaques, statuary. Free catalog. Write Bing Products, 88-A6B Broad Street, Boston 10, Mass.

RESILVER Mirrors at home. Formula 25c. Ideal Service, Park Ridge 8, Illinois.

PRIZE Contest bulletin gives various contests now operating, and valuable hints. 3c stamp. National Contest Bulletin, Box 2685P, Miami, Florida.

WIN Contest money. Send 25c complete instructions for writing winning answers. Winacontest, 22P Westlake Ave., Auburn, N.Y.

WINDSHIELD Wiper rebuilding brings big profits. Free particulars. H & H Products, Box 430, East Akron 5, Ohio.

MAKE Sell new amazing auto paint you simply wipe on. Complete formula \$1.00. Ideal Service, Park Ridge 8, Ill.

WIN Contest prizes, cash! "Here's how." Alfred Novak, 2601-M Division, Cleveland 13, Ohio.

SELLS Like mad! Show it once—smack! It's grabbed! No sales talk. Costs \$2. Brings \$5. Just one of those inexplicable successes. Inquire Stampico, 8837 Quincy, Detroit 4, Mich.

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EARN Money at home! Thousands do! "Home Worker Magazine" tells how. Sample, 25c. Sizemore, Box 7, 4917 Kostner, Chicago 30, Ill.

WIN Contest money. General Contest Magazine gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minn.

WOULD You pay 3%—first \$350 made? Color-illustrated book "505 Odd Successful Enterprises" free! Proven! Work at home, office. Expect something odd! Pacific, Oceanside, Calif.

PUBLISH Your own magazine. Hand-some 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample. details. National, Ord, Nebr.

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MEN—Women—"Most everybody likes candy." Learn to manufacture in a professional manner. (Our 38th year.) Ragdale Candies, D4, East Orange, N. J.

TESTED Formulas—Genuine manufacturing processes. Literature free. Chemical Service, Edwardsville, Illinois.

FORMULAS For twenty-five useful products. One dollar. Chemist, Box 274, West De Pere, Wisconsin.

24 MONEYMAKING Formulas 50c postal note. C. Bibbs, P.O. Box 5157, Indianapolis, Ind.

MAKE Sell cleaners, soaps, polishes, flavors, cosmetics. Literature free. Kemico, Park Ridge 16, Illinois.

21 POPCORN, Candy apple, etc. formulas. All money-makers. \$1.00. We can supply equipment. Concession Supply Co., Dept. "A," Box 133 Sta. "B," Toledo, O.

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REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

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PLASTICS—Sheets, rods, tubing, coatings, shells, findings, dyes, craft supplies. Lucite scrap 25c-65c pound. Illustrated fabricating manual, price list, 10c. Lucite sample, 35c. Courtesy to dealers. Gem-O-Lite, 5350F Riverfront, North Hollywood, Calif.

PLASTICS For fun and money. Build a business in your home with Parrokit—contains materials for production of buttons, toys, and novelty jewelry. Complete instructions guaranteed. \$5.00 f.o.b. factory. Parrot Plastics, Inc., 143 Hecker St., Belleville 7, N. J.

LUCITE, Plexiglas. Masked sheets. All sizes. Cost square foot (12" x 12") 1/16" 90c; 1/8" \$1.16; 3/16" \$1.43; 1/4" \$1.68; 5/16" \$2.09. Include 10% postage. Almac Plastics Inc., 230 Fifth Avenue, New York 1, N. Y.

AMAZING Liquid plastic pours without heat. Beautiful castings within half hour. Clear, colors. Embed photographs, coins, flowers, keepsakes. Complete kit \$2.90 (U.S.A.) Kristalon Plastics, Dept. A-6, Box 29, Wilmette, Ill.

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PLASTIC Injection machine, plexiglas, jewelry findings, dyes, cements, tools, drills. New catalog. G. Baker Company, River Edge, New Jersey.

SUMMER Special. Prime quality masked Lucite. 3/16", 16" square \$2.45 postpaid. Free catalogue. Craft-Plastics, Somerville 1, New Jersey.

INTERESTED In new ideas in plastics? Information free. Designers Group, Box 363, Pleasantville, New Jersey.

PLASTIC Materials. Cements, dyes, findings, internal carving drills. Send 10c for catalog and floral carving instructions. Locket with internally carved rose and bud 50c less findings. Art Plastics of Calif., 8125 East 14th Street, Oakland 3, Calif.

BARGAINS In plastics. Lucite, Plexiglas, Catalin. Many colors and sizes. Details free. George Plastics, 6936A George St., Chicago 34, Ill.

RENEW Leather and leatherette—Make cloth into imitation leather with plastic discovery called Leather-New. Opportunity to make real profits taking care of sales resulting from national advertising. Write for free sample of Leather-New covered material and complete deal. 4723B Troost, Kansas City, Missouri.

PLASTIC—Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2618 St. Louis Ave., St. Louis 6, Mo.

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CHEMICALS, Ounce quantities. Catalogue 5c. CJ Chemicals, 19165 Gallagher, Detroit 34, Mich.

LEARN Chemistry at home, from the house of Winn. Home of supplies for student chemists. New idea chemical and apparatus outfits for home experimenting. Photographic scales, semi-professional microscopes and accessories. Send 15c for retail catalogue. Established 1931. John H. Winn, 124A West 23 Street, New York 11, N. Y.

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CHEMICALS And apparatus for industrial, analytical and private laboratories. Complete supply service for correspondence school students. Send 10c for catalog. Dept. M-43, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 7, New York.

FREE Catalog: Chemistry, mineralogy, physics, biology. Tracey Laboratories, Evanston, Illinois.

APPARATUS, Chemicals, ounce quantities, catalog 10c. Fleischer's Laboratories, Everett 49, Mass.

HANDBOOK For chemical experimenters. Illustrated, hundreds of experiments, 50c. Experiment booklet 15c. Supply catalog 5c. Reading Scientific Company, Reading, Penna.

HELP WANTED

EARN \$25.00 Quickly with fast-selling Whitwell stationery and greeting cards. Costs nothing to try. Samples on approval. Whitwell Co., 143 Transit Bldg., Boston.

BOYS Wanted. Over \$50 week! Sell name plates for front doors. Write National, 214-CC Summer, Boston, Mass.

AGENTS WANTED

AGENTS—Call on garages, filling stations with \$24.50 quality wheel balancer. Competing models to \$2,000. Virgin market. Five minute demonstration means sales. \$10 cash commission. Twenty sales possible daily. Exclusive territory. Write B & B Mfg. Co., Box Z 816, Sioux City, Ia.

SALESMEN: \$20 To \$30 a day easy. Sensational new raised letter metal nameplate, beautifully framed in mahogany. Amazing seller to homes, stores, offices, etc. No deliveries. Get our tested plan. Write Raised Letter Metal Co., Dept. 2288 Fox Bldg., Philadelphia 3, Penna.

NO Summer slump in magazine sales! Make money year 'round taking new renewal orders from neighbors, friends. Helps furnished. Free catalog. Write McGregor Magazine Agency, Dept. 12, Mount Morris, Illinois.

AGENTS—Unbelievable, until you have tried this self selling foot bath powder. 98% people need it. 50% profits. Excellent repeater. Rush name for free sample. Saari, 1916 Sheffield, Chicago 14.

SELL Ultra blue stock signs to stores, 1000 slogans, comedy, general, religious. 7x11, cost 6c, sells 35c. Make money. Sample free. Lowy, 8 West Broadway, Dept. 384, New York City 7.

IF You are a sales-producer you'll be interested in an exclusive territory on a fast-moving, easy-selling household item—one you're proud to sell. Users enthusiastically endorse it—and we mean it! Not sold in stores. Protected territory, generous commission to aggressive agents. If you can sell house-to-house, this is your deal! Write us today for details. The Sheldon Company, 1223 So. 23rd Street, Milwaukee 4, Wisconsin.

\$1 STARTS You in business. Sell deluxe ties, 100% wool interlining. Costs you only \$7 per dozen, you make \$5.00 dozen. Send \$1.00 for special introductory offer two deluxe ties. Catalog complete line free. Philip's Neckwear, 20 West 22nd St., Dept. K-24, New York 10.

MEN—Women. New sensational floor mop. So clean to use women can wash floors in evening gown. No splash or drip. Magic Mop, 8427 So. Chicago, Dept. PM, Chicago.

PROFIT Now! Substantial earnings made in magazine subscription sales. Trade price list and supplies free. Instructor Subscription Agency, Dept. PM, Dansville, New York.

WANT Pleasant outdoor work in a business of your own? Good profits selling over 200 widely advertised Rawleigh home/farm necessities. Pays better than most occupations. Hundreds in business 5 to 20 years or more! Products-equipment on credit. No experience needed to start—we teach you how. Write today for full particulars. Rawleigh's, Dept. F-145A-PPM, Freeport, Ill.

BIG Money selling plastic tablecloths—from \$6.00 dozen. Also curtains, aprons. Fast sellers! Free details. Durever, 255C East 95 Street, Brooklyn, N. Y.

AMAZING "Shampoo" auto washer. New invention. Lightning seller. Automobiles gleam like mirror. Samples sent on trial. Kristee 123, Akron, Ohio.

REMNANTS—Amazing values. Housewives buy on sight. Good profit. Write B & M Textiles, 78 N. Main St., Paterson, New Jersey.

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SAVE! Million articles wholesale. Directory 10c. Publishers, Box 1302-P6, Detroit 31.

EARN \$5.00 With every ten \$1.00 boxes of everyday cards you sell. Also new plastic cards, personalized stationery, note paper and wrappings. Send for samples today. Howard P. Ellis, Dept. PM-7, Pittman, N. J.

MAKE Sensational profits! New, sell-on-sight plastic lining tablecloths, aprons, many other splendid fast-selling items, novelties. Postal brings free details, special deals. Hurry! Royalty, Box K-748, Passaic, N. J.

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PAINT. White house paint, for wagon jobbers and auctioneers. 95c gallon in 5-gallon cans, single gallons \$1.00. Minimum 50 gallons, f.o.b. Kansas City. Surplus black enamel 75c gallon. Aluminum paint for every purpose, \$1.50 gallon. Packed 4-gallon in carton. Mail check or money order for immediate shipment. No correspondence. Trading Post, 2032 Burlington, North Kansas City, Mo.

SILVERWARE Cleaning, plating, polishing. Liquid (NuSilver). Apply with cloth. Contains genuine silver. Renewals silver-plated ware, articles, pieces. Silverplates brass, copper, bronze. Part, full-time, agents wanted. NuProcess Products, Aurora, Ill.

LADIES Leather handbags \$5.50, retails \$12.50. Caspy, 239 Dumont Ave., Brooklyn 12, N. Y.

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BUY Thousands of nationally advertised products direct from manufacturers. Write for "Buy Direct and Save." Consumers Ass'n., 287-A-Lebanon Ave., Mt. Lebanon, Penna.

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THERE'S Money in chemical specialties! National mail order tests brought thousands of orders for Liquid Plastic Tarnish Preventive and Rub On Silverplating Fluid. Agents and distributors now offered long discounts. Sell dealers, industrials, better homes. Write for sales plan. Samples \$1.00 postpaid. (refundable). United Technical Laboratories, Morristown 9, N. J.

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SELL Gold embossed monogram stationery. Sample free. Dunbars, Sanford, Florida.

EARN Big money year 'round. Be a one-person-department-store. Take orders for shirts, ties, hosiery, lingerie, household linens, etc. For information, Corporate Merchandisers, Dept. PM 3, 110 West 34 Street, New York City 1.

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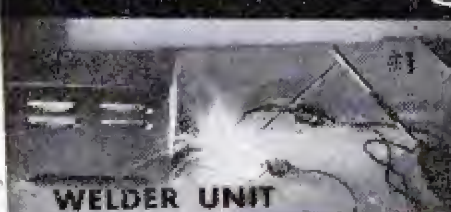
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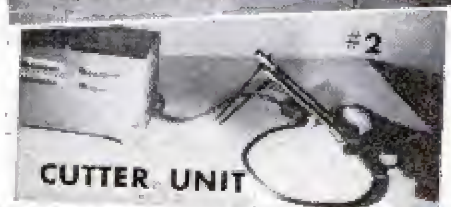
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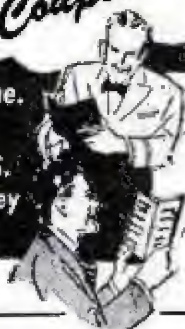
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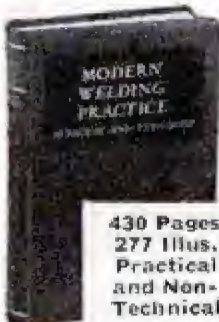


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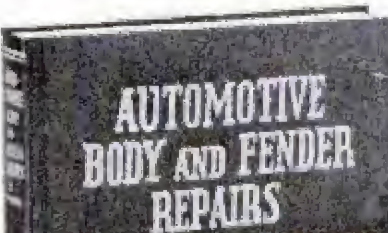
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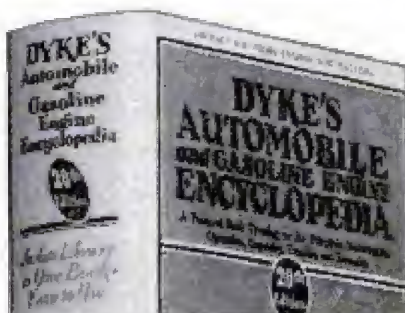
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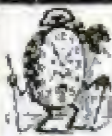
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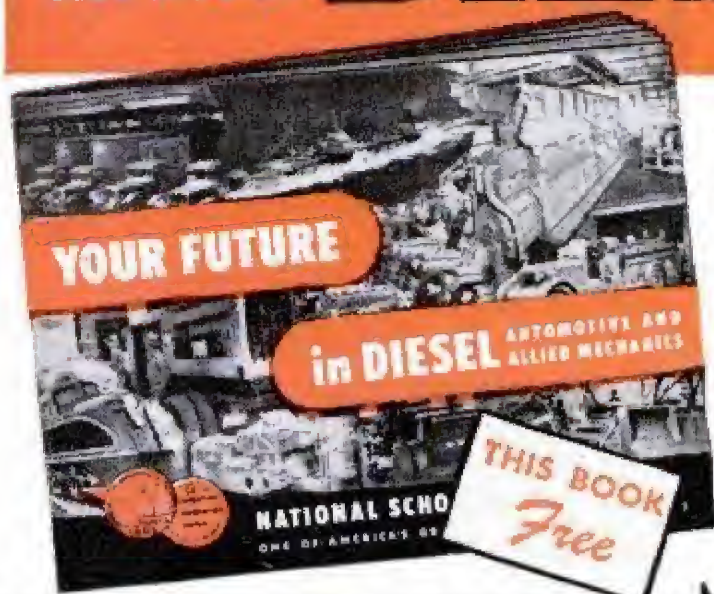


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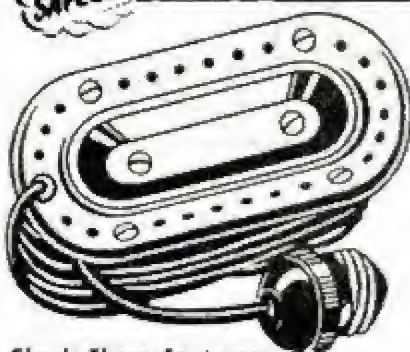
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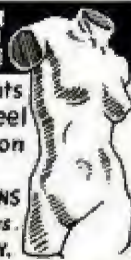
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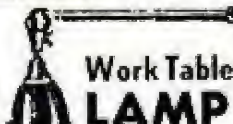
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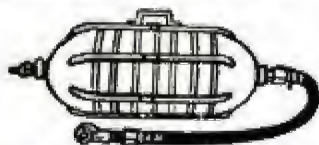
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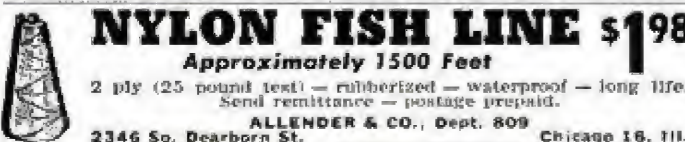
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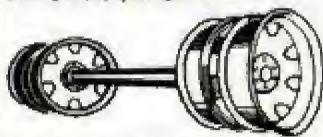
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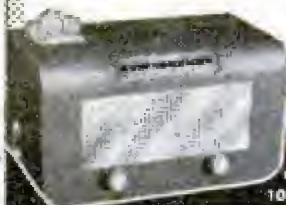
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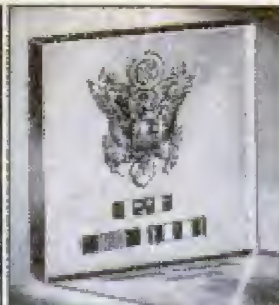
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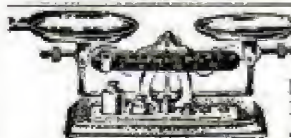
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A high pressure shatterproof tank of 500 cubic inch capacity—for 50 pound pressure or 6.8 cubic feet. All metal—measures 6 1/2 x 2 1/2 inches. Threaded plug end vents. Shp. wgt. 6 lbs. No. 388—Each **\$2.45**

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A high pressure shatterproof tank of 1000 cubic inch capacity—for 50 pound pressure or 13.8 cubic feet. All metal—measures 11 1/2 x 17 inches. Threaded plug end vents. Shp. wgt. 11 1/2 lbs. No. 389—Each **\$3.75**

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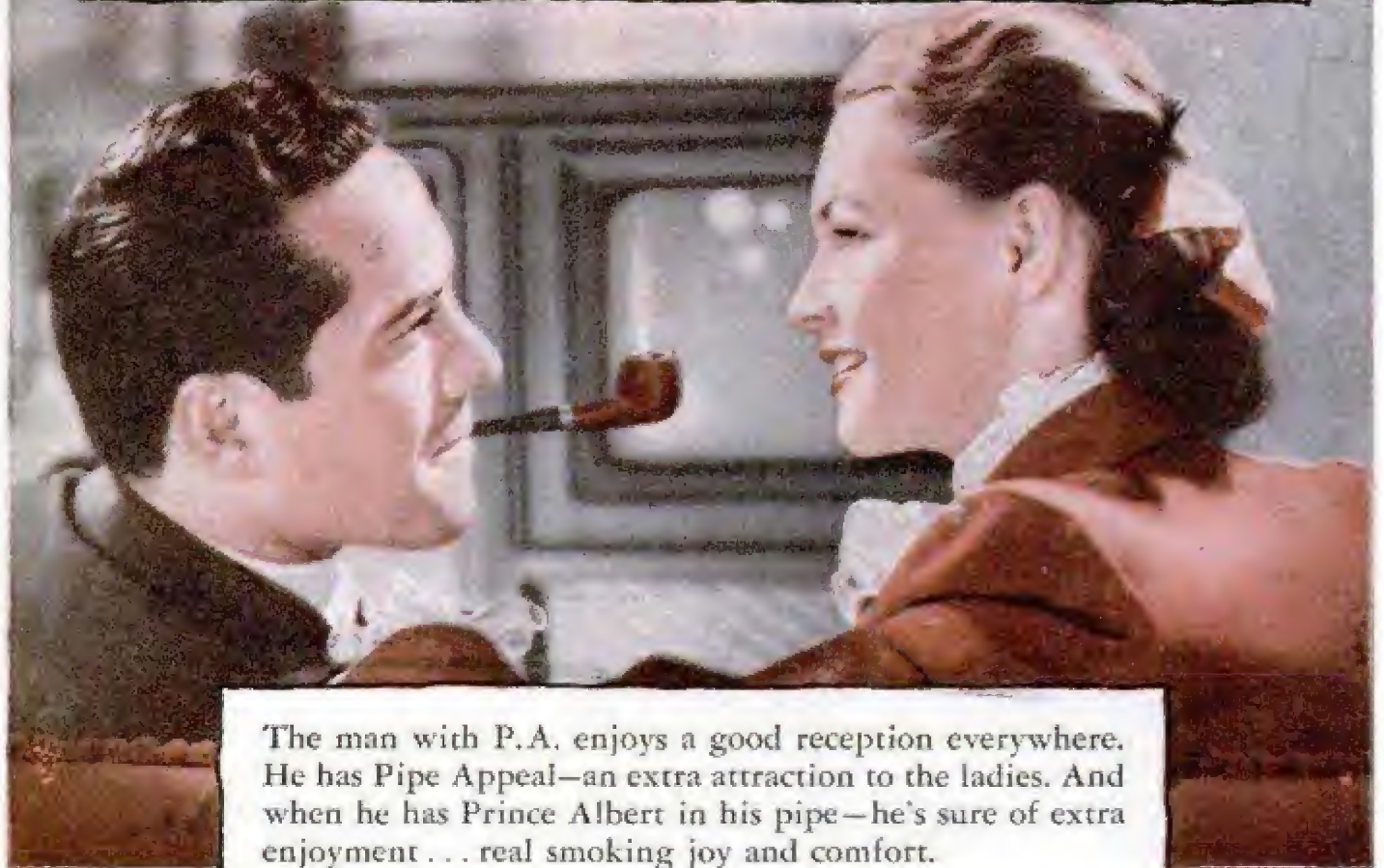
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THE NATIONAL JOY SMOKE

PALOMAR

opens its
eye

POPULAR JUNE 1948
MECHANICS

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 89 NO. 6



With shutters rolled open, the largest telescope ever made stands ready to give man a long look into space

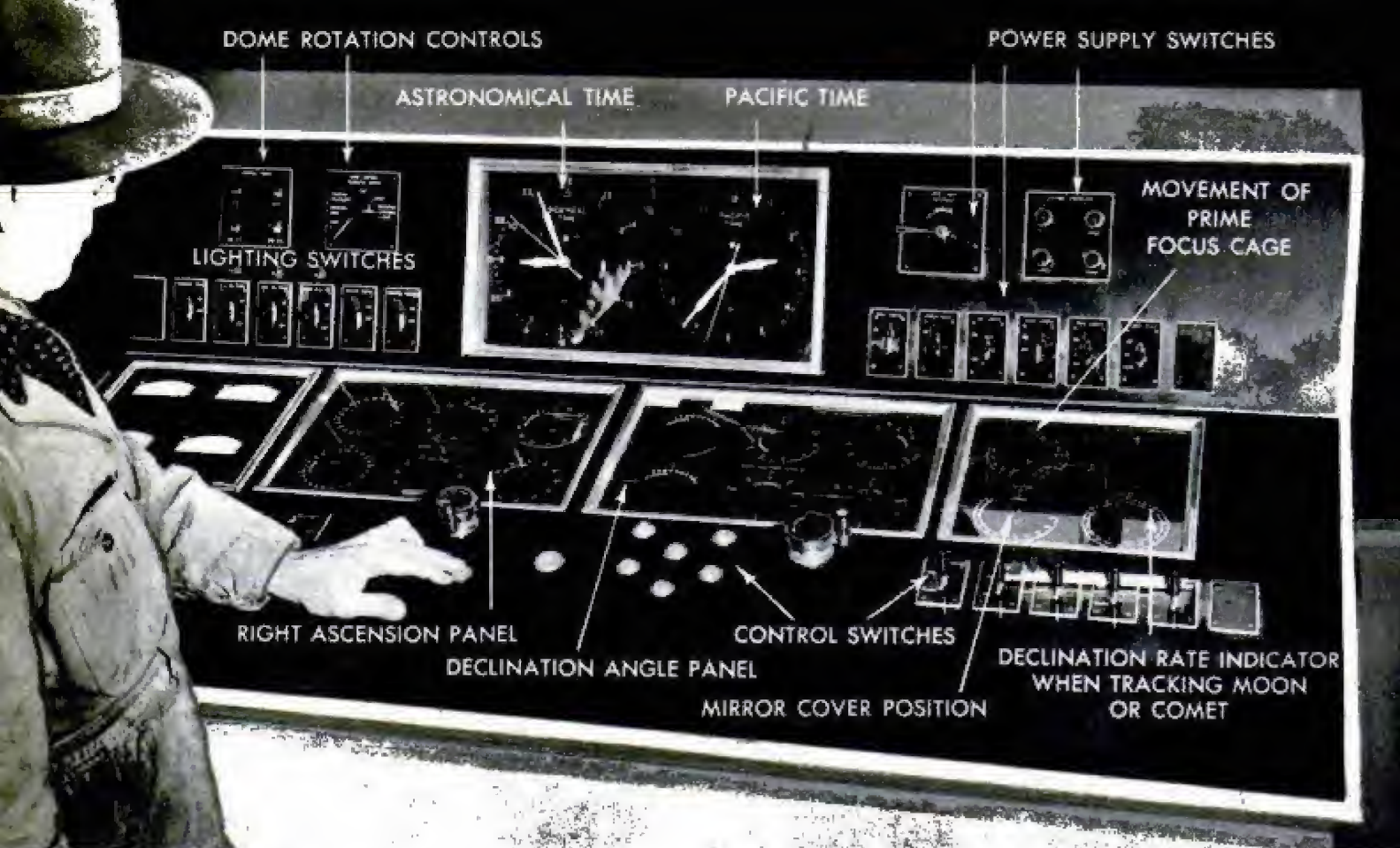


THE 200-INCH Palomar telescope now is ready for man to peer a billion light years into space—twice as far as any astronomer has ever seen before.

Some evening early this month a scientist will climb to the small cage atop the giant eye and prepare the instrument for use. He'll pause for a glance into the open top of the pedestal, where the light from the big mirror narrows to a focus. It's a spectacular reflection of a small portion of the sky above him, extremely bright because of the power of the telescope.

His first task will be to bring the top of the pedestal, where the photo plate will be exposed, into sharp focus. Next, he'll move a microscope attached to the pedestal until

Light-beam telephones eventually may enable scientists at Palomar to talk with those at Mt. Wilson



Controls permit observer to track star. Both star and earth are moving constantly

↓ Temporary hood across top of tube allows testing of all parts of the mirror to bring them all into focus

he pin-points a convenient bright star that he can use as a guide star during the exposure. For a few moments he will watch the star against the illuminated cross hairs of the microscope to make certain that the telescope is tracking properly and, if necessary, push buttons to correct the telescope's motion.

Finally he will insert the photo-plate holder and pull the slide. For the next hour, if the exposure is to be that long, he

will sit with his eye glued to the microscope, watching his guide star dance and shift about. Radiation and other atmospheric conditions keep star images on the move and the astronomer's constant task during the exposure will be to reduce this motion as much as possible by manipulating hand knobs that can move the microscope and photo plate a thousandth of an inch.

Meanwhile at Mt. Wilson 90 miles to the northwest another astronomer undoubtedly will be making a duplicate photograph of the same portion of the sky.

It will be extremely interesting to compare the two pictures, one made with the 100-inch telescope that until now was the world's largest and the other made with the new 200-inch companion. Although an hour's exposure is not enough to test the limits of either telescope, the Palomar picture should show stars that are only half or a quarter as bright as the faintest stars on the Mt. Wilson photograph.



Translating light into distance, the Mt. Wilson telescope has reached half a billion light years into space. The telescope on Palomar should see twice as far, multiplying by eight times the volume of space that can be examined.

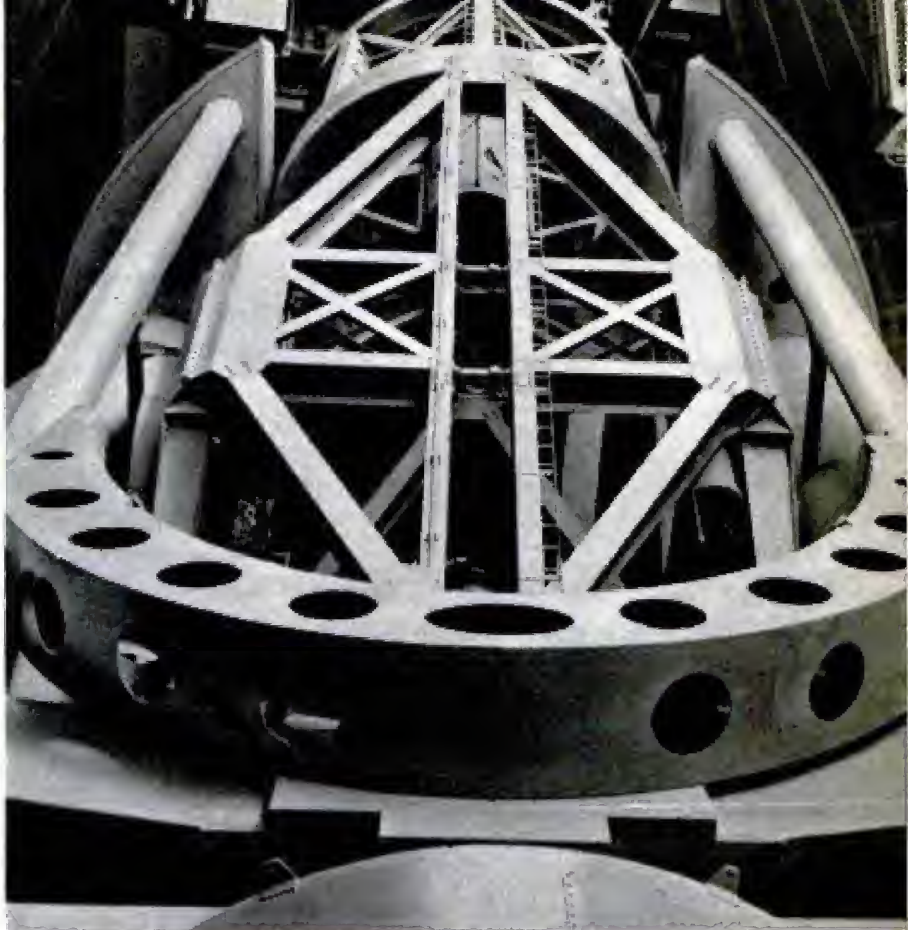
That range and scope permits photographs that should confirm or disprove a number of theories about space and the bodies that inhabit it. Is the shift to the red in the spectra of distant nebulae and galaxies a true indication that the universe is expanding? If so, are nebulae as uniformly distributed through the outer reaches of space as they appear to be closer to us? The 200-inch telescope will be able to reach a large enough section of the universe to permit a fair sampling of it.

What are the stars made of? Mostly of hydrogen, to the best of our knowledge, but the question is whether hydrogen and other elements are distributed uniformly in the different stars even though the physical conditions of the stars vary widely. By being able to widen the spectra of distant stars so that the spectral lines can be studied in detail, the Palomar eye may vastly increase our information. This information, in turn, may help answer two basic questions—the source of stellar energy and the origin of chemical elements.

What about Mars? While the 200-inch telescope is intended for long-range studies, it undoubtedly will be used occasionally for photographing objects in our own neighborhood. Most photographs of Mars made in the past have been time exposures that were unavoidably fuzzy. No photograph has revealed the "canal" system with the amount of detail that many observers have reported.

Technically it will be possible with the giant eye to make motion pictures of Mars at normal exposures, with a good chance that one frame in a thousand or so will have been exposed at a time when there was no shimmer or twinkle in the atmosphere. One clear sharp photograph should disclose whether the so-called canals exist. If they ever show up in a photograph it would be strong evidence that intelligent life exists on that planet or existed in the past.

Some night when the bright full

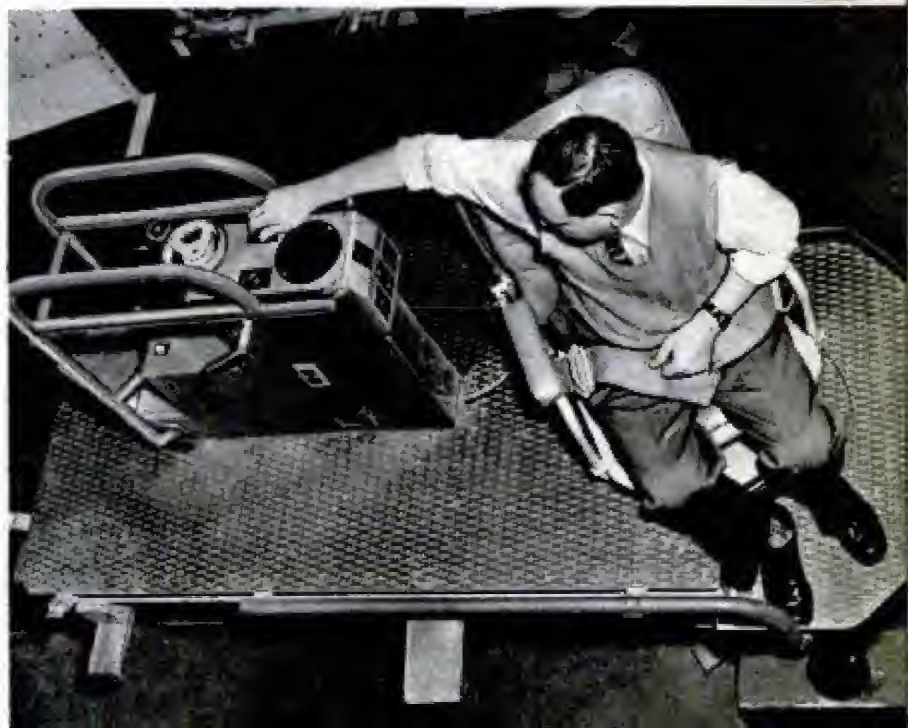


View of telescope inside its mounting shows the horseshoe-type bearing. In this position telescope is pointed at North Star

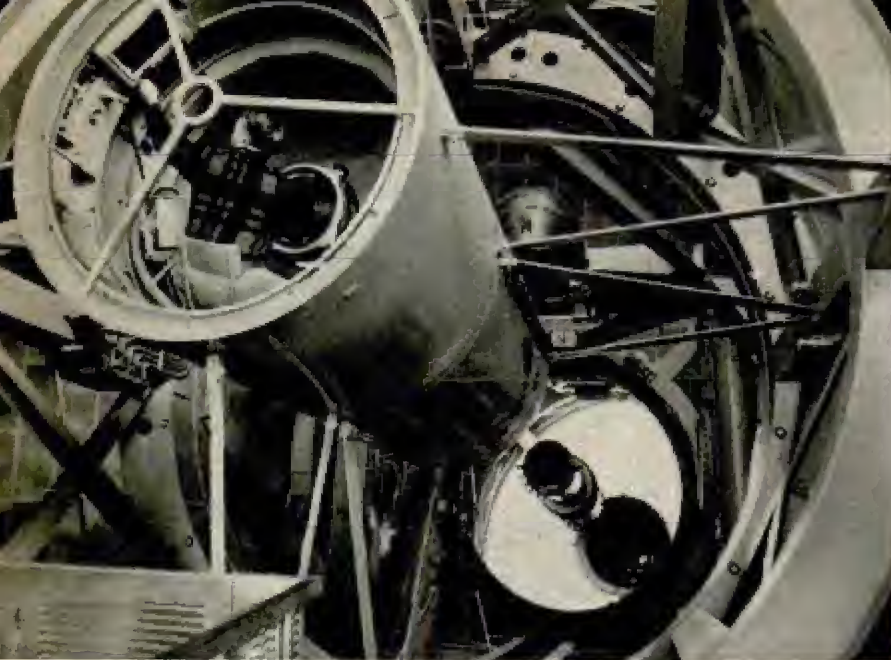
moon spoils conditions for long-distance photography we can expect that an astronomer will take a close-up portrait of the earth's satellite. The field of view of the 200-inch is so small that it will be necessary to take five or more pictures and piece them together to get the entire moon.

The complete picture will be four feet seven inches across, equal to a view of the moon from only 500 miles away. By careful enlargement it will be possible to bring out details of the moon's surface as seen from an altitude of 100 miles or less.

The new Palomar telescope is a versatile



Platform to be placed on mobile tower permits observations from floor under tube



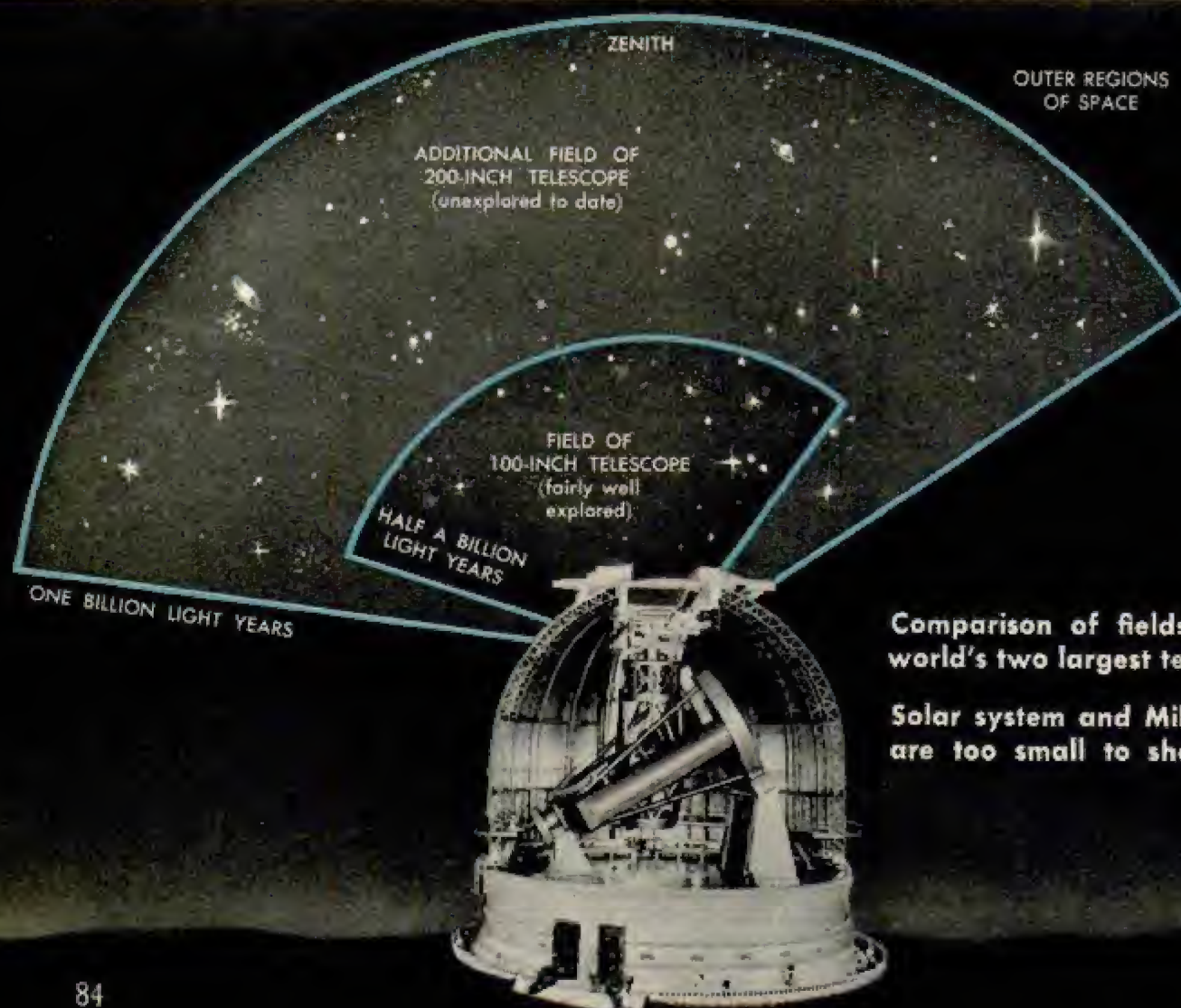
† Photo plate is mounted in front of operator inside cage at the prime focus of the huge mirror. Right, drawing shows astronomer in the cage atop the telescope. By moving knobs he adjusts for atmospheric tremor

instrument. Actually it is three telescopes in one, or will be when all of its auxiliary mirrors are installed.

The prime focus is the point high above the mirror at which reflected light from the stars comes to a sharp focus. It provides the strongest light and will be used for rapid photography. The photographs of

star images made at the prime focus can be enlarged many times or examined under a microscope.

Next is the Cassegrain focus below the center of the big mirror itself. Light that is reflected upward from the 200-inch mirror is caught by a smaller hyperbolic mirror that swings into place and directs the light



Comparison of fields of the world's two largest telescopes

Solar system and Milky Way are too small to show here

downward again through a tube in the center of the big mirror. Images are five times larger than at the prime focus but the intensity of light is less. The Cassegrain focus will be used principally for spectroscopic work, studying the elements that make up the stars.

The third optical system employs other mirrors that lead the light from the big reflector into a constant temperature room where spectroscopic studies will be made and some photography will be done. Called the Coude focus, this system provides large images of reduced brilliance.

In all there will be eight mirrors mounted in the tube and on the yoke of the telescope. Each of the seven auxiliaries is a large mirror in itself; two of the mirrors used in the Coude system, for example, having diameters of 48 and 36 inches. Small counterbalances are attached behind the auxiliary mirrors to prevent distortion of focus when the mirrors are moved.

The same type of counterbalancing system is used with the 200-inch mirror itself. Without it the 17-foot-diameter glass disk would sag and bend in different positions. If the big mirror were supported only at its edges, for instance, its middle would sag a fifth of a thousandth of an inch, a huge quantity optically and about 1000 times the allowable error.

Each of the auxiliary mirrors also has an additional counterbalance to offset its weight so that there is no effect on the alignment of the telescope or on its balance when a mirror is swung into place or out of the way by its own crane and motor.

Mechanically the telescope is about as fine an instrument as science and engineering can build. In spite of its enormous weight it is designed to move with utmost smoothness when tracking a star and to avoid any flexure that would affect its optical systems. The skeleton tube, its mirror and prime-focus cage weigh 140 tons and can be pointed in any angle from the North Star almost to the southern horizon without distortion from gravity.

The entire moving weight consisting of the telescope and its equatorial mounting is some 500 tons, and this weight floats, literally, on thin films of oil that permit smoother motion than would be possible with ball or roller bearings. The 14-foot worm wheels that turn the telescope were cut in a special temperature-controlled



Complex system of counterbalances under the 200-inch mirror keeps the surface from distorting as the mirror is shifted

machine shop on the California Institute of Technology campus and errors in spacing the teeth were kept to less than one ten-thousandth of an inch. Even the thrust bearings of hard tool steel were especially treated to insure smoothness of movement. Ordinary machining was not good enough. To reduce friction to a minimum the bearing surfaces were polished in an optical polishing machine with the same care given the telescope mirrors themselves.

All these efforts to achieve a perfect instrument would be defeated if temperature variations inside the observatory dome should have an effect on the telescope's optics. Elaborate precautions are taken to avoid this. In the first place the dome shutters are kept closed during daylight hours. The dome is really a double dome separated by a four-foot air space

(Continued to page 252)

Worm gear is cut to accuracy of less than one ten-thousandth of an inch per tooth, permitting the exact tracking of a star





↑ Surplus boat looks like a derelict washed ashore. Right, a new bow is built out from the battered hull



Senior Chaffee and his three sons operate the unique drydock. Below, finished pleasure craft sleeps three to five, has washroom and galley, and makes 20 knots

'Beauty Shop' for Boats

Battered landing craft—the ugly ducklings of the war—are converted into sleek cabin cruisers through the combined efforts of the Chaffee family of San Diego, Calif. John Chaffee and his three sons operate a “beauty shop” where the scarred vessels are given a face lifting to fit them for use as pleasure craft. The senior Chaffee takes charge of the stockroom, one son is a carpenter, another a welder and the third a machinist. The battered craft are on sale as war surplus for about \$750 apiece. After one surplus sale the family found 27 of the LCVs awaiting rejuvenation. A new bow is built around a steel gig, and a cabin is erected, including three to five bunks, a galley and washroom. The re-conversion cost varies from \$400 to \$7000, depending on labor involved. The finished craft, with extra fuel tank, has a 1400-mile range, a speed of 20 knots and enough eye appeal for any yachtsman.





Spray Gun Supplies Own Pressure

Touch-up painting and other small paint jobs can be accomplished quickly with a self-contained spray gun that requires no compressor or air lines. Pressure is provided by a carbon-dioxide cartridge that fits into the hollowed handle and is punctured when the handle is screwed on the gun. Made of cast aluminum with brass and stainless-steel precision parts, the gun weighs only 26 ounces.



Electric Motor Drives Bicycle

Gasoline rationing doesn't bother the Britisher who built a tiny sidecar for his bicycle and mounted an automobile starter motor and storage battery on it. The motor drives the rear wheel by link chain and a control lever is located on the handle bars. Noiseless, the motor bike climbs steep hills easily and rolls along at 20 miles an hour. The 12-volt battery also powers the lights and horn.



Tension Tester for Hacksaw Blade

Tensions of hacksaw blades are checked by a tester with an easy-to-read dial. The meter is fastened to the blade, which then is tightened to the proper tension. Blades of any thickness, length or width can be checked with the tester. Proper tension of the blade produces straight cuts and prolongs the blade's life.



Pipe Has Built-In Cleaner

Pipe smokers who like to keep their pipes clean will find it is easy to do with a new pipe that has a built-in clip for holding cleaning tissue. The forked metal clip takes the place of the usual filter inside the pipe stem. Small pieces of tissue are inserted in the clip and used to wipe out the bowl and stem in ramrod fashion.

This is the first of a series of "behind the wheel" articles on new cars. The next article will be devoted to another real postwar automobile

Hudson rear seat is wider than the car is high! The 16-inch armrest folds down from the seat-back cushion. Note recessed door panels



TAKE THE WHEEL

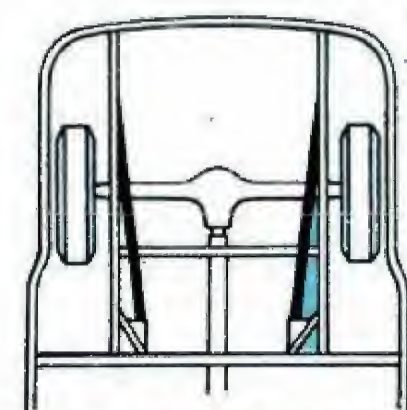
By Wayne Whittaker

STEP RIGHT UP, mister, and get behind the wheel of that new Hudson at the top of the opposite page.

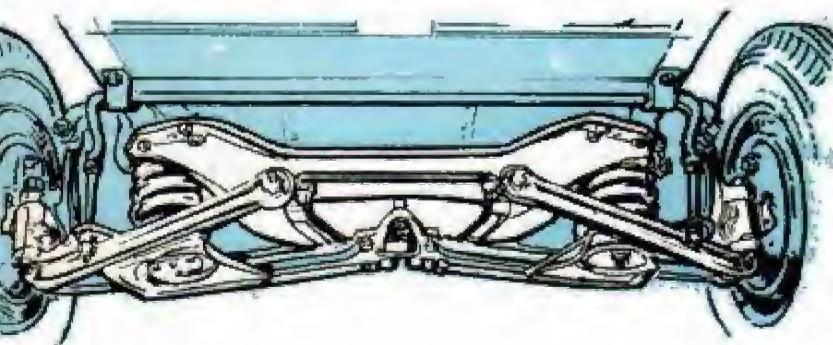
Our objective is to take you on a 150-mile drive through city traffic, over country roads, bumps and smooth pavement, around sharp curves, up and down hills, through rain and shine. We received the full cooperation of the weatherman in providing the rain and shine for your first ride. The purpose is not to sit in judgment on the new Hudson and tell you that it's good or bad. **YOU** take the wheel and decide for yourself from the actual performance of the car.

All set? First, meet Milton S. Bald, veteran service engineer for Hudson who handles all field contacts in the engineering department.

"I'm just along for the ride and to answer



Above, leaf springs in rear set at slight angle and coil springs (below) in front ease car over bumps



Below, the new Hudson frame cradles riders within box-steel girders. Floor is several inches lower than door sill



At your service—a nicely broken-in six-cylinder new Hudson equipped with semi-automatic Drive-Master shift



OF A NEW HUDSON

any questions," Bald explains. "Don't let me cramp your style in putting this car through its paces."

The car you are going to drive is a six-cylinder four-door sedan—just what you asked for.

"Did you know," asked Bald, "our Six is the largest six-cylinder engine built for a passenger car today? It has so much zip—121 horsepower—that most drivers can't tell it from an Eight except at very high speeds."

You press the trigger-release of the fixed door handle and step in—or more correctly down—to enter the car and take your place behind the wheel. The first impression is one of sitting closer to the ground than you do in other cars. Your shoulders are about level with the lower ledge of the window.

"Feel like you're sitting on the floor?" Bald asks.

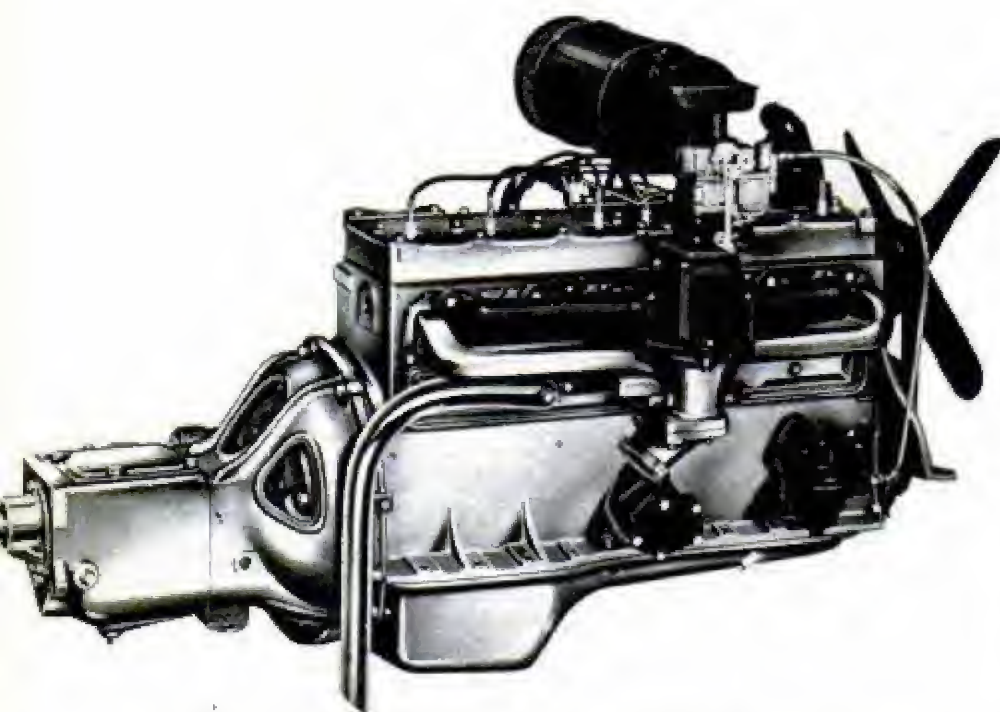
"Nope," you reply, "visibility is too good for that. Besides, it's comfortable and I got in easily without knocking my hat off. That's something these days."

Bald laughed. "Fine! The reason for the headroom is that you are sitting so low. Remember the car is only five feet high. Floor and seats are down inside the frame. This is where we get that step-down feature. That new frame is a beauty and actually combines body and frame in a single all-steel unit. I'll show you some cutaways of this when we get back to the office and you can decide for yourself whether or not it looks like a good safety feature."

The car you are about to drive is well broken in—9000 miles. It is equipped with

Left, phantom feet show hydraulic and mechanical brake positions—the latter operates with pedal all the way down. Right, Milton S. Bald, Hudson field engineer, checking engine after a test drive of 150 miles



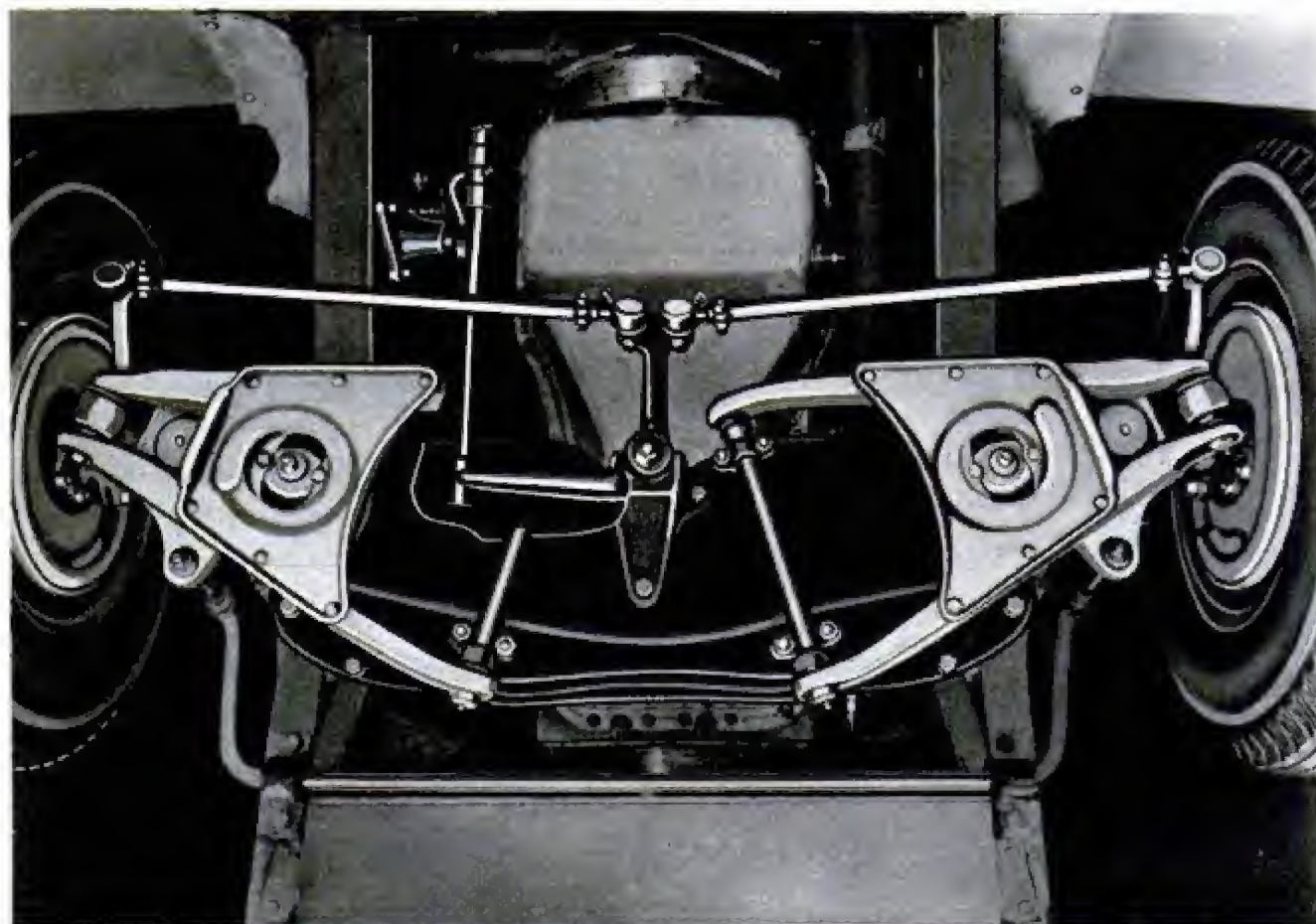


New Hudson Super-Six engine is most powerful (121 horsepower) of any engine its size on market. The L-head motor is pressure lubricated at 41 points. Bore is 3-9/16 inches; stroke 4 1/4 inches

a Hudson Drive-Master transmission in addition to the manual controls. You press the starter button and nothing happens. Bald explains that on the Drive-Master cars you have to throw in the clutch before the starter will operate. This affords double assurance that the car is in neutral when you start up.

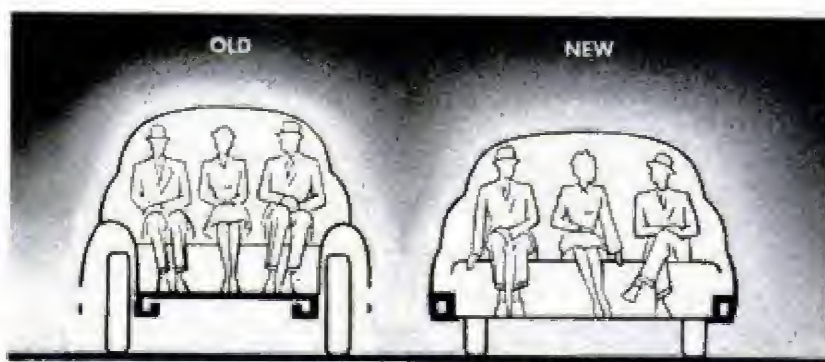
"If you've been driving a car without automatic shift," says Bald, "you'll find yourself making a lot of false motions with your left or clutch-operating foot."

Now you study the Drive-Master control knob on the instrument panel and are swamped at



Steering system is perfectly balanced to end "roaming" and "wheel fighting." Hudson's Center-Point steering operates from exact center of the car and affects both front wheels equally

Sketch at right shows how new Hudson frame extends outside of wheels, also lowering of floor for more headroom. At far right, the "new" sketch shows rear seat moved forward





Low center of gravity helps the new Hudson hug the road on sharp curves; tires are all super cushion

first by a choice of three shift arrangements: (1) conventional manual control with normal clutch and hand shift; (2) something they call Vacumotive Drive which means manual shifting with automatic clutch, and (3) Drive-Master in which you put the shift lever in high position and step on the gas.

Your indecision as to which to try out first is ended by Bald, who says: "Of course, you'll want to use Drive-Master. This actually amounts to starting off in second and any time after the speed is above 13 miles an hour just lift your foot all the way up on the accelerator pedal and you'll be in third. When you want to stop just step on the brake. Simple, isn't it?"

You decide that with all this automatic equipment it is a relief to know that all you have to do is flip a switch to get back to the familiar conventional hand-and-foot shift. Besides, it seems logical that conventional shift might be handy on an icy pavement or if you got stuck someplace.

All right. You put the shift lever in high. The road ahead is clear. With your left

foot feeling neglected, you press down on the accelerator pedal and the car moves smoothly away. At 25 m.p.h. you release your foot from the accelerator and you are in high. After a short distance you decide to try a stop to test Bald's instructions. You slow down and then apply the brake. The car stops. There is no creep. You step on the gas again and move out into traffic.

Bald grins. "I can see automatic shift has made another convert."

You decide it would be awfully easy to get spoiled by an automatic transmission. Bald reminds you that the Drive-Master costs only \$99.92 additional.

As you head north out of Detroit you come across a section of pavement that the Michigan Highway Department forgot. The car rides smoothly over holes in the pavement that are fully 2½ inches deep. There is no rumble, no rattle and no bouncing around. You are driving 50 miles an hour.

"Jam the brakes on," says Bald.

You do. The car comes to a smooth and steady halt. There is no pitch. The Hudson

(Continued to page 248)



The Sternwheeler Still Rules the River

IN THE YEAR 1890, tense crowds on the banks of the Columbia River held their breath as the sternwheeler Harvest Queen swooped past. On that day, clocked by officials, the old sternwheeler actually ran a measured four miles through the treacherous cascades of the Columbia in four minutes flat—60 miles per hour!

By Tom Riley

The Harvest Queen was one of the fastest sternwheelers, yet she could actually do only about 23 to 25 miles an hour. It required the dangerous help of a rapids at flood stage, plus a stern wind, plus a skillful pilot, to boost her to that mile-a-minute speed. But it also took a highly maneuverable, shallow-draft ship to challenge those

rapids. "That's the point," say the rivermen, "she was able!"

The Harvest Queen was unmistakably able and so were all the other old packets that were so successful on the wild rivers of the West. They were specialized ships—slender, fast boats with huge engines and great maneuverability. They carried fewer passengers and less cargo than the famous sternwheelers of the Mississippi. They had to be faster and more maneuverable to run those narrow, treacherous channels.

Today you can still see these ships on the Pacific coast. Sternwheelers are no longer the main method of transportation—the railroads, the highways and airlines have

Queen of the Columbia and Willamette Rivers is the new Portland, modern and efficient, yet patterned after sternwheelers built at turn of the century. Designers could make few improvements on yesterday's vessels



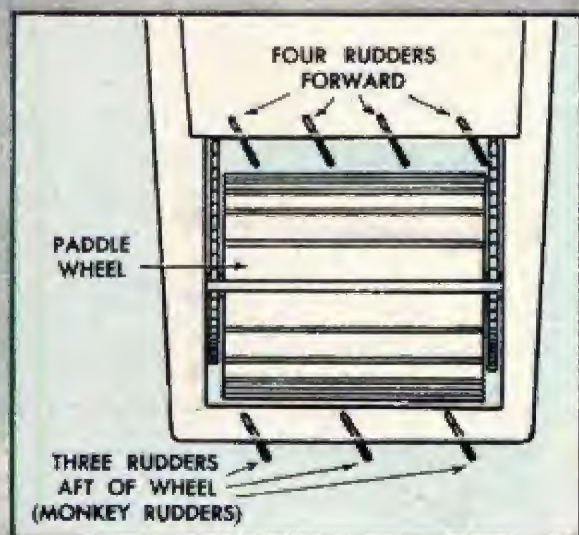


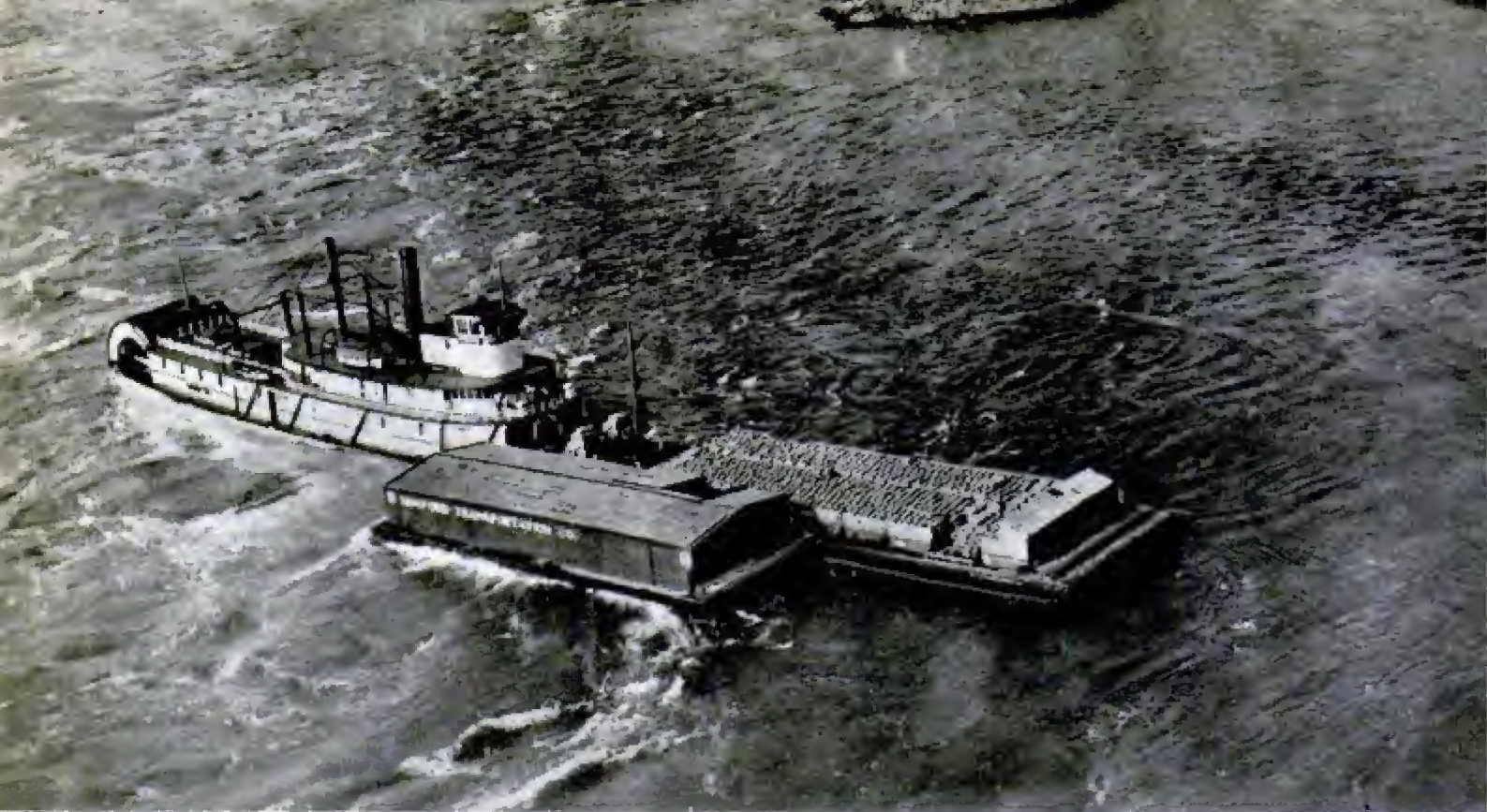
With brass band playing, Harvest Queen starts Sunday excursion in 1890. She still holds speed record. Left, diagram shows how wheel thrusts against rudders whether the ship moves backward or forward

taken over—but the sternwheeler is still queen of the western tugboats.

She is queen because of her inherent “ableness.” It is an important trait at the seaport of Portland, Ore. There the clumsy ocean liners are helpless. They cannot turn nimbly in the swift currents of the Columbia and Willamette Rivers nor can they maneuver alongside the crowded docks and berths. And when they are moved to and from the drydocks they are “dead” ships, ships without steam in their boilers. They must be towed.

The 19th-century skippers would be astonished by the number of big ships that must be towed today. One sternwheeler on the Willamette, the old Henderson, handled more than 5000 ships by herself during the recent war and is still going strong, even though she was built in 1912 with engines taken from a still older ship. Her old days of racing other paddlewheelers up the river, spilling the morning coffee on the houseboats along the banks, and making





Paddle wheel churning, the Cascades guides two barge loads of wheat through rapids of Columbia River

leisurely Sunday excursions with the brass band playing are gone. She and the others must have steam up day and night. They must be ready at all times to assist the big ships into their berths. It's a different job, but the skippers are proud of their packets, now queens in a new trade.

Last fall the old design proved itself again, a half-million dollar's worth of proof. The City of Portland decided to replace an old municipal-owned sternwheeler, the Portland, which had been berthing ships on the rivers for 30 years. A modern Diesel tug was recommended but experienced river pilots quietly asked if anyone had looked at the sternwheelers lately. The pilots admitted that Diesel tugboats were cheaper to build nowadays but argued for sternwheelers because of the greater maneuverability that was needed in fast currents. They proved it takes only one of even the oldest sternwheelers to handle a ship, instead of the two to four Diesel tugs that are required. They proved from records that the sternwheeler has much less maintenance and breakdown. After long testing and planning, a modern sternwheeler, the second Portland, was built.

Perhaps the most interesting feature about this new ship is that neither its builders nor its designers could find any major improvement to make over the ships built at the turn of the century. They will frankly admit that the greatest change is in the price, the new Portland costing

\$500,000 while the most elegant packet of the 1900s cost only \$45,000. The designers of those old-time ships can receive no better praise.

The new Portland has been improved, of course. She has an all-steel welded hull instead of a wooden one and she has double the horsepower of the older stern-wheelers. Her oil-fired boilers are compact and extremely efficient, about half the size she would have needed for her 2000-horsepower 20 years ago. The gingerbread dec-



Log raft is given a final lashing of chains. For decades sternwheelers towed such rafts down the river



Bridge controls include: 1, signals to engine room; 2, deck whistle; 3, intercom speaker; 4, mike to deck speakers; 5, steam-powered steering lever; 6, emergency wheel; 7, engine-room telegraph; 8, searchlight control

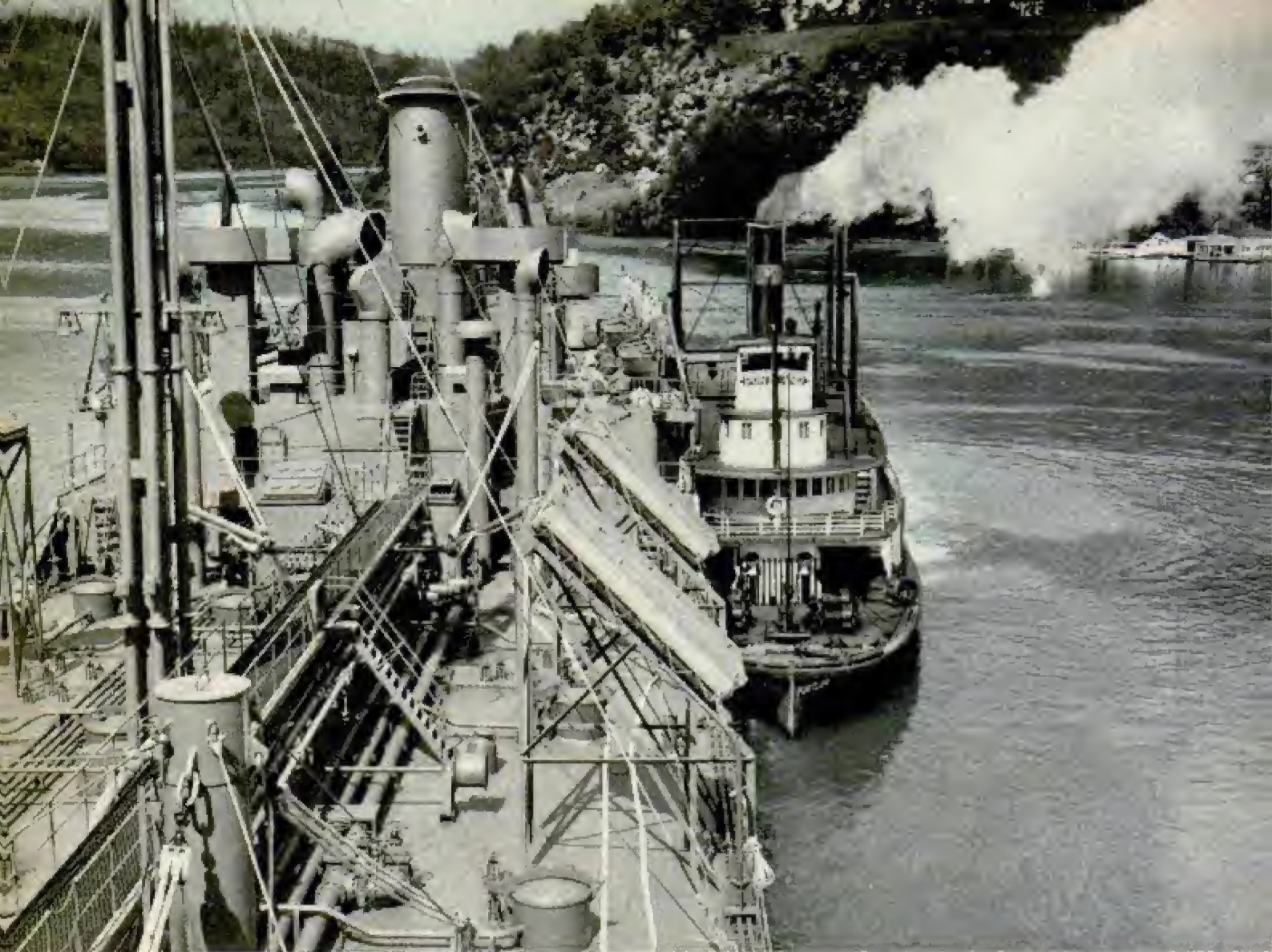
orations that the early skippers cherished are gone and the congested deck spaces have been eliminated. But the basic design is the same—little improvement has been found for the shape of the hull, superstructure, huge paddle wheel, rudders and design of the engines.

The new Portland's pilothouse contains some of today's aids to navigation. Loran and radar have not been installed, as this

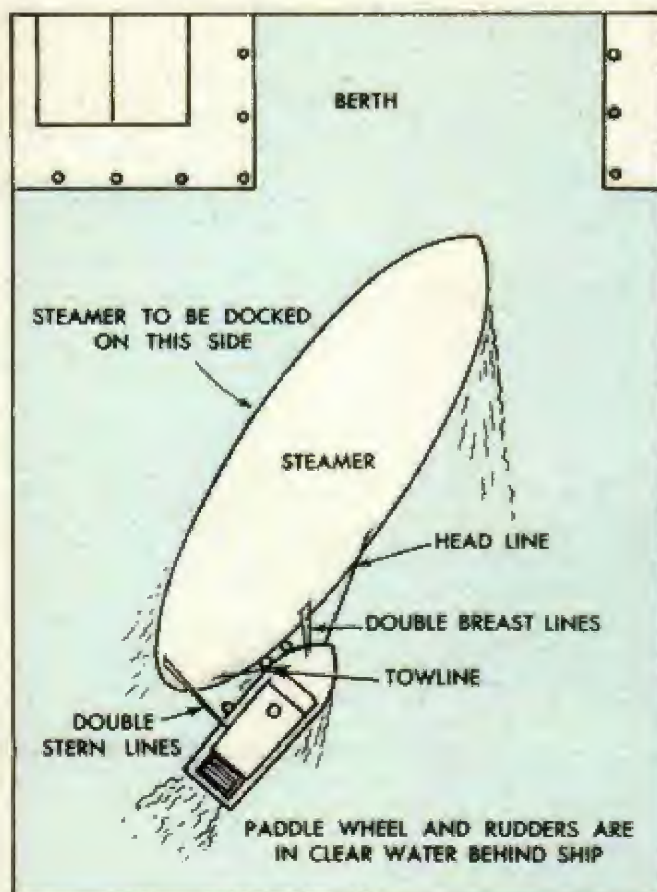
ship operates only along the waterfront of a busy port. But the power steering is improved with the latest in steam-operated rudder engines that enable the pilot to turn the ship by moving a small lever. Throughout the craft, intercommunication systems carry the skipper's instructions to his crew. Even the deck winches have intercoms alongside to transmit orders from the pilothouse. With the flip of a switch,

Photo taken in 1889 shows sternwheeler carrying covered wagons. Note the similarity to today's river tugs





Portland noses tanker up the river. Below, diagram shows how the tug is lashed to steamer for berthing



the skipper can project his instructions through a large amplifying loudspeaker to the crew of the steamer being towed. A ship-to-ship telephone has been installed on the new Portland. On 500 feet of wire, one phone is passed aboard the towed vessel so that the pilots can have direct communication for difficult maneuvers.

With its great flexibility and power the new sternwheeler now is handling steamers easily by itself. No fleet of tugboats are needed as in eastern ports. Capt. Sidney J. Harris, master of the Henderson (the oldest on the river) agrees when Capt. Robert Williamson of the new ship explains:

"She just handles a liner better. We call it rudder power because her power to maneuver is obtained from the thrust of the wide paddle wheel on several rudders.

"Say you turn a ship with an ordinary tugboat. The only turning force or rudder power you have is the water moving against one rudder. If you must stop your tug and then turn, the only rudder power you get is the little bit of water that's pushed by the propeller against that one rudder. It's not enough out here. You'll

(Continued to page 232)

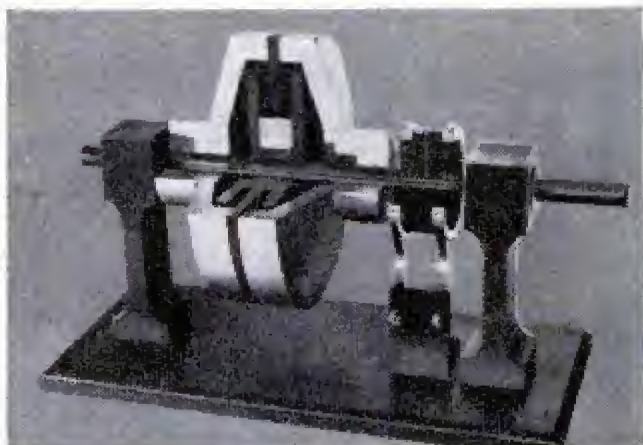
Fluid in Magnetic Clutch "Solidifies" to Transmit Power



Fluid mixture of fine iron powder and oil such as used in new clutch "solidifies" in magnetic field

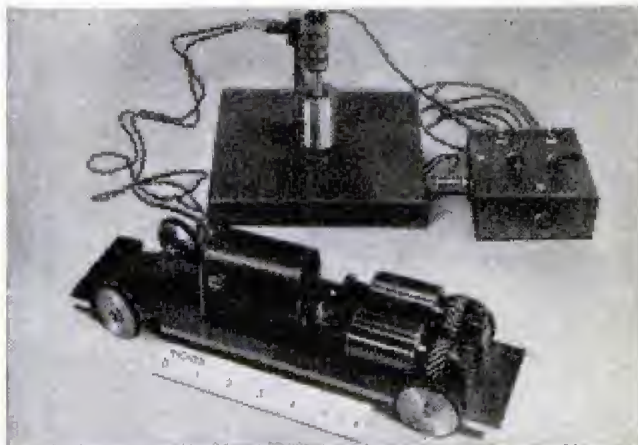


Model bus equipped with magnetic fluid clutch and brake (see below) is demonstrated by the inventor



Cutaway of clutch with electromagnet in center. Magnetic action on fluid locks the two plates together

Particles of iron dust which are affected by electric power form the heart of a new magnetic fluid clutch that is simple to build and gives jerk-free operation. The clutch, invented by Jacob Rabinow of the National Bureau of Standards, can be applied to servo mechanisms which automatically control mechanical equipment, to automobiles and many control devices. The clutch consists of a driving shaft with a plate at its end and a driven shaft and plate. Between these two elements is an oil bath which contains millions of metal particles. As electric power is applied between the plates, the particles form chains which lock the two plates together as strongly as though they were clamped. The amount of magnetization controls the strength of the bond, so that a gradual increase produces a smooth clutch action. When the clutch is



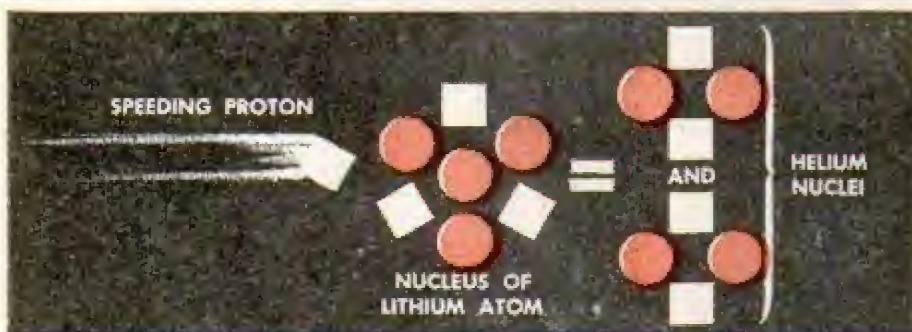
Two cylinders on bus chassis are magnetic clutches, one of which is locked to frame to act as a brake

fully engaged there is no slippage and wear is held to a minimum. Any wear which may occur simply adds to the supply of metal particles. The clutch principle is equally applicable to brakes. Rabinow has assigned patent rights to the government.

Activated Charcoal Protects Young Plants

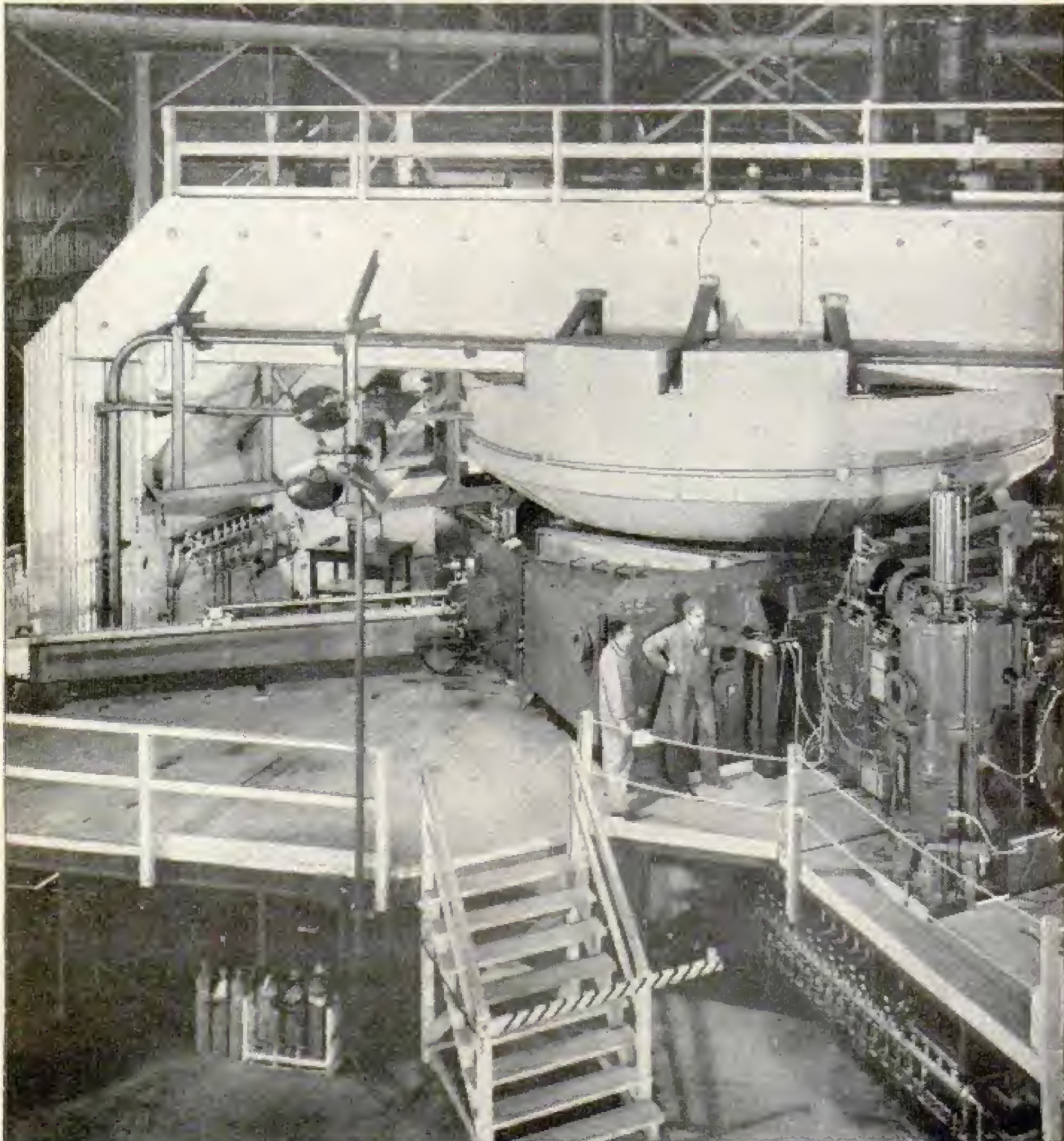
Treating the roots of young plants before setting with powdered activated charcoal protects them from harm by 2, 4-D used for killing weeds. Tests made on sweet-potato sprouts showed that untreated plants suffered a high mortality when planted in 2, 4-D-poisoned soil. The treated plants, though sustaining some losses, survived much better. The experiments were made by the Department of Agriculture and the Mississippi Agricultural Experiment Station.

Attacking *the Mysteries of*



Left, drawing of what occurs when nucleus of a lithium atom is hit by a speeding proton. Result: two helium nuclei

↓ Cyclotron at the University of California has a 4000-ton electromagnet. In it, mesons were man-made for first time



the Atom

By Thomas E. Stimson, Jr.



Used in plant experiments, radioactive carbon dioxide is trapped in spiral glass tube by plunging it into a beaker of liquid nitrogen where it freezes

ONE OF THE LAST great mysteries of the universe, the nature of the powerful "glue" that holds matter together, is being studied at a dozen laboratories.

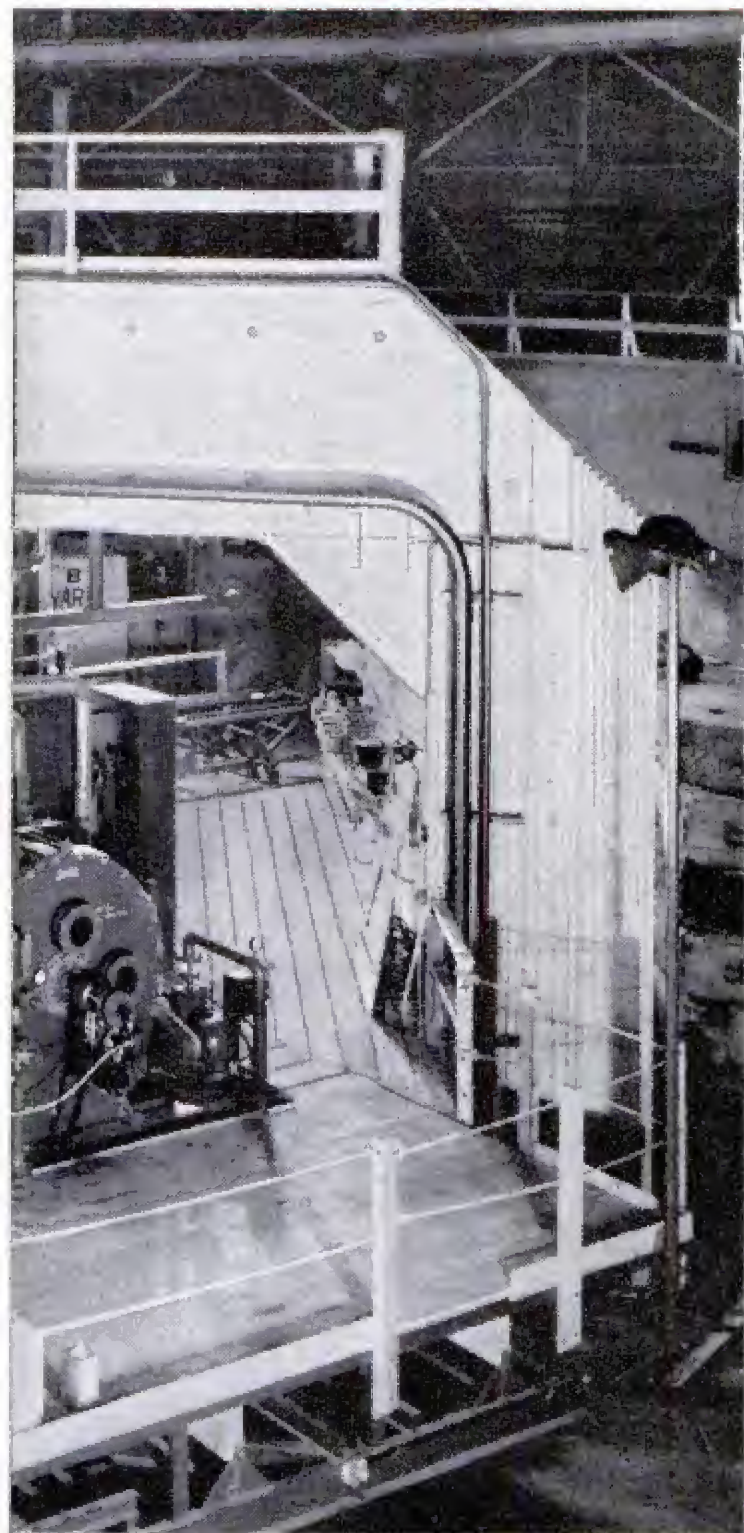
This glue is the force that binds protons and neutrons together to form the nucleus of an atom. It is so strong that only cosmic rays or other high-speed particles such as are accelerated in a cyclotron can overcome it.

Except for this binding force it is possible that everything in the universe including the earth and yourself would consist of a thin homogeneous cloud of identical atoms, possibly of hydrogen since that is the simplest atomic form.

Practically all science knows about the force can be stated in a few words: It is millions of times stronger than gravitational attraction or magnetism and hence isn't either of these; nor does it seem to be electrical in nature.

The atom bomb was only a milestone in atomic research and today more attention than ever before is being directed toward discovering the basic laws of matter and energy. More information about how a nucleus is bound together is one goal; more understanding about the steps that occur when matter is transmuted from one element into another is a second; and more knowledge of everyday things that can be gained with new atomic tools is a third.

Much of this research is centered on the West Coast. At the University of California at Los Angeles, for instance, Dr.





Path of radioactive material, inhaled through mask, is plotted by gamma-ray counters directed at the chest, abdomen and legs of girl volunteer

Reginald Richardson is seeking more information about the mysterious nuclear glue. He is using the original cyclotron that was invented by Dr. Ernest O. Lawrence and that has just been moved to the campus at Los Angeles.

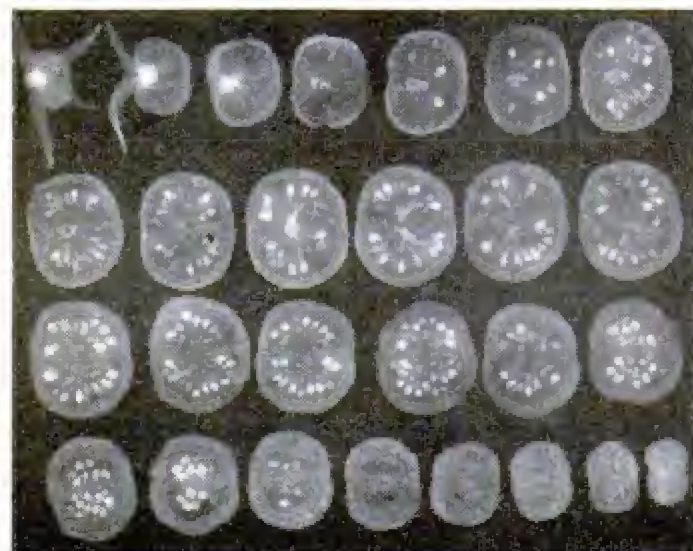
are limited to observing the results that occur when nuclei are bombarded. These observations are made by means of cloud chambers, proportional counters and photographic emulsions. Such an emulsion is placed alongside the cyclotron beam and is

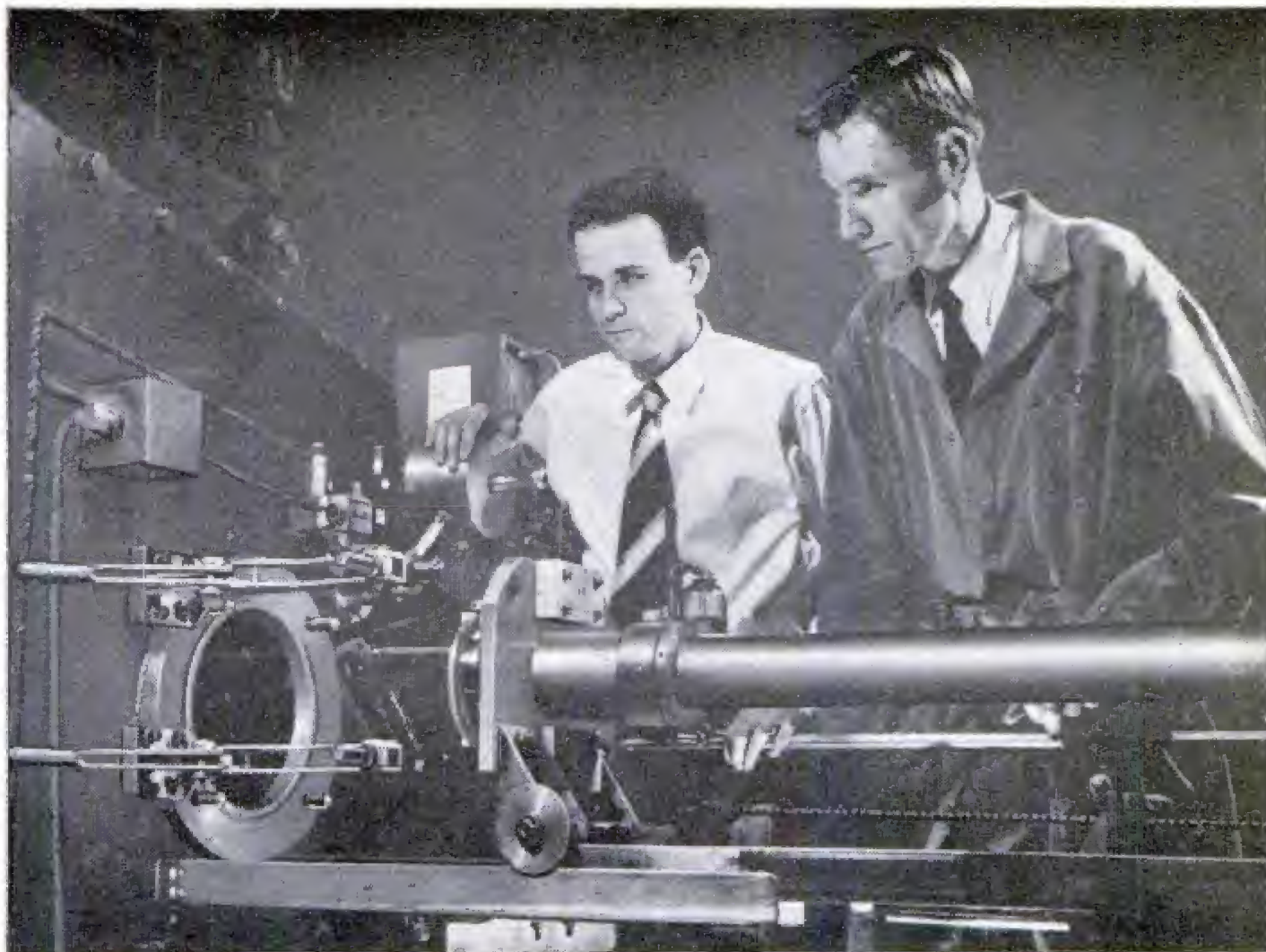
A pygmy by comparison with the giants that have been built since or are now under construction, the pioneer cyclotron has been converted into a stronger synchrocyclotron by powering it with frequency-modulated current. Particles that are emitted by the synchrocyclotron have an energy of some 15 million electron volts, which is more than enough for smashing nuclei.

The frequency-modulation apparatus consists of a 36-toothed wheel that rotates at up to 2000 r.p.m. in a vacuum chamber. Each tooth serves as a condenser as it speeds past a ring of stationary plates, permitting the tuning of the resonant circuit of the cyclotron through a wide frequency range. This mechanical apparatus does as good a job as would electronic FM equipment that would require 50 times more power.

No nuclear studies are possible by direct observation so Doctor Richardson and his associates

Photographs show radioactive absorption by plants as white areas. Left, tomato slices with concentration in seeds, skin. Right, placed on top leaf, radioactive material followed stems of leaves outlined by dotted lines



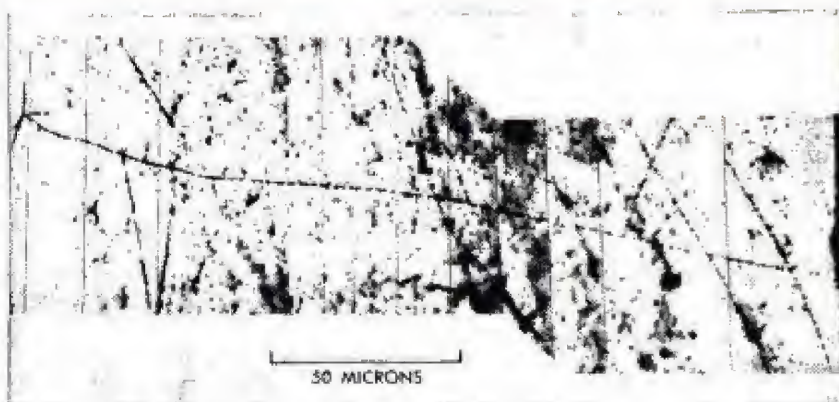


† Scientists who produced first man-made mesons prepare cyclotron for experiment. Right, lateral line made by meson before exploding in "star" at the left edge of photomicrograph

developed after some of its silver grains have been ionized by flying particles. The photograph is then examined under a microscope.

"An understanding of the force that binds a nucleus together is perhaps the most fundamental problem in nuclear physics," Doctor Richardson states. "However, no one expects to solve the mystery this year or next. Only after the work at numerous laboratories has been completed and the results compared can we anticipate understanding how the force operates."

Attacking the same problem from a different angle, scientists at the Berkeley campus of the university recently were able to manufacture a powerful particle called the meson, or mesotron, for the first time. Until now this particle had been created only by cosmic rays in the upper atmosphere. Artificially created mesons are a new and powerful bullet for blasting open atomic nuclei. Although they live for only a fraction of a second they may be-



come an important tool in studying the forces that hold the atomic heart together. Too, there seems to be a possibility that the meson can be used to start a chain reaction in some heavy elements, adding to the number of elements from which energy may be taken.

Atomic scientists are still in the exploration stage. What seem to be new types of particles and stages of energy are being discovered all the time. The meson, for instance, now is believed to have four or more different varieties. The job of classifying energy states is a tremendous one and, as a division of this work, the Kellogg Laboratory of Radiation at the California Institute of Technology and other laboratories are making precise studies of the



Cut barley leaves in an atmosphere of radioactive carbon dioxide are exposed to light for varying time periods in study of plant photosynthesis

various states in which the nuclei can exist.

Once it was thought that each element had only one form, then it was learned that there can be different isotopes or varieties of the same element, each with the same atomic number but containing different numbers of neutrons. Many of these isotopes are unstable or radioactive and some 400 useful radioactive isotopes are known. It is believed that each element can exist in many different excited forms, some of which have an observable life and some of which last only a fraction of a second.

To observe these states, various elements are bombarded with streams of protons, deuterons or other particles and the results examined by means of a magnetic spectrograph that consists of a magnetic lens and a counter somewhat similar to a Geiger counter.

These streams of particles are accelerated in a huge electrostatic generator, not nearly so powerful as a cyclotron, that has the advantage of providing a beam that is extremely well defined, is constant and can be concentrated at small targets. Because of this low intensity and lack of scattering, research workers do not have to observe the extreme precau-

tions against radiation sickness necessary around large cyclotrons.

Atomic energy has been a Pandora's Box to humanity so far but scientists believe that vast good is to come of it offsetting the atomic bombs and radioactive poisons of war. Harmless radioactive isotopes that are manufactured in cyclotrons and uranium piles, for instance, are pointing the way toward better health and better living.

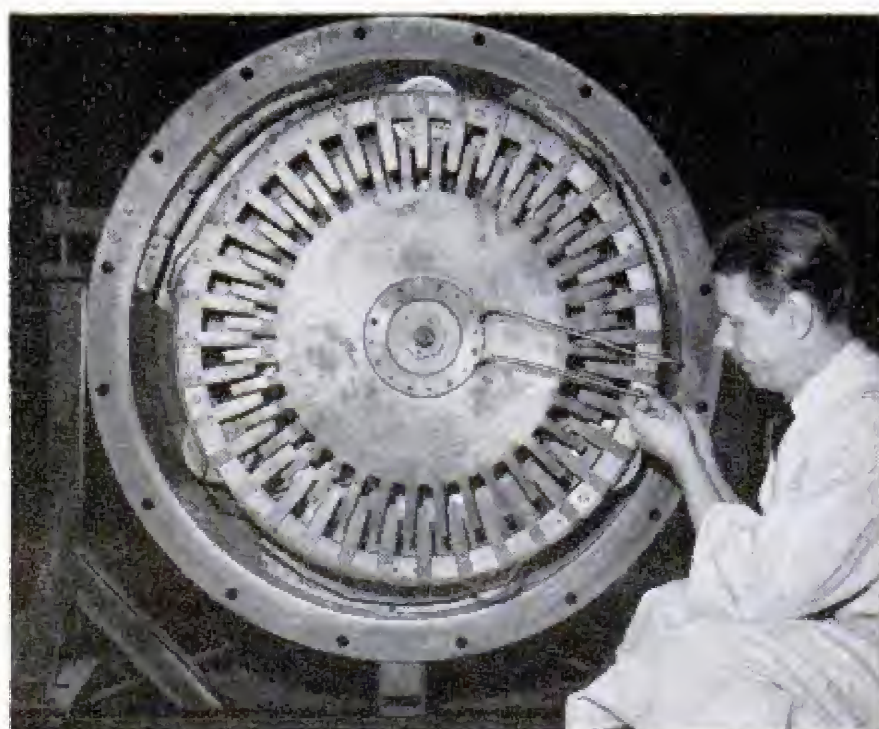
These tracer atoms now permit research that wasn't practical before. The tagged atoms give off emanations that can be detected by tiny vacuum tubes, making it possible to follow their paths through many involved

chemical and physiological processes.

Petroleum researchers are using tagged atoms in seeking new cheap ways of combining hydrogen and carbon into synthetic fuels and oils. Similar research with radioactive atoms of metals may improve the strength, weight and other characteristics of many metals in common use.

At the Berkeley campus of the University of California a diversified program of atomic research with tracer elements is now being conducted under the auspices of such agencies as the International Cancer Research Foundation, the Atomic Energy

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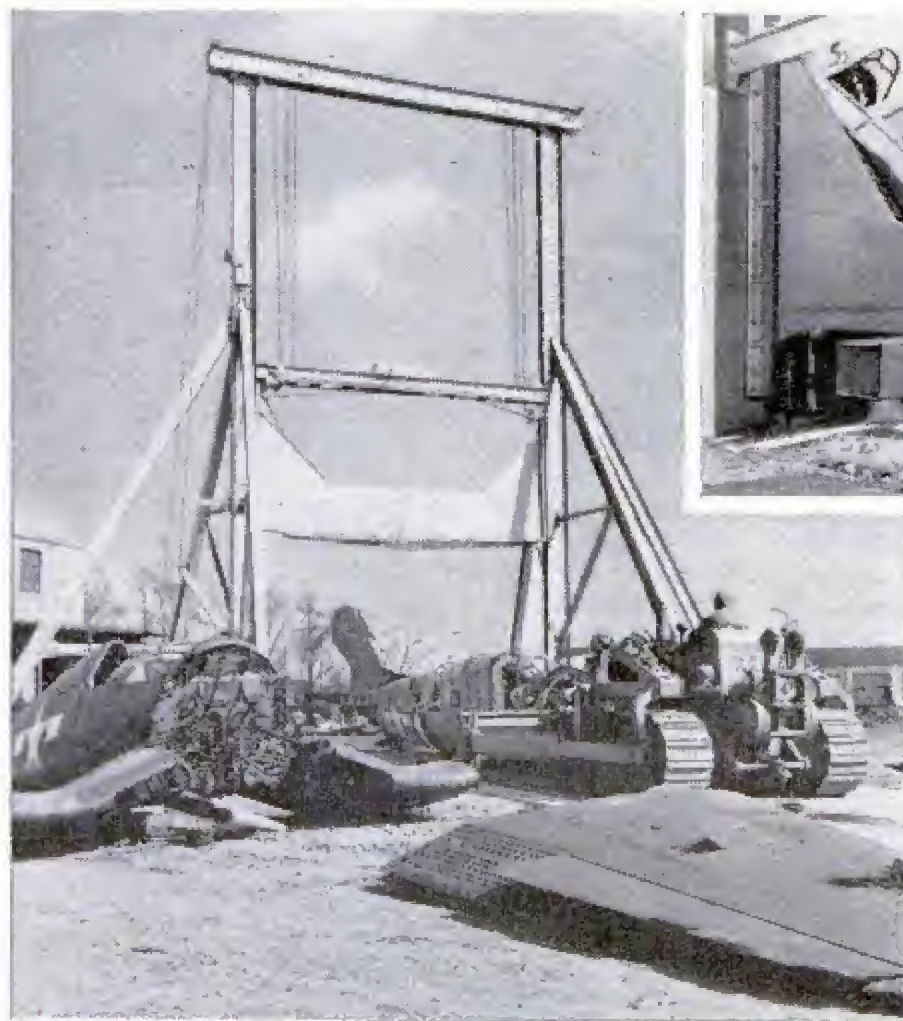
Rotary condenser creates frequency modulated current in cyclotron

Plastic Covers For Seed Beds

Seed beds with plastic covers are hailproof, shatterproof and light in weight. The covers, made of Celanese Vimlite, a plastic-coated wire mesh weighing less than glass, pass on to the plants most of the sun's ultraviolet and infrared rays. Instead of pivoting on hinges, the covers slide to the rear. The beds are made of aluminum and are three feet square, sloping from 15 inches high at the back to nine inches at the front. They are assembled without bolts and can be folded flat when prepared for storage.



Electric Guillotine "Finishes Off" Obsolete Navy Planes



Official photo U. S. Navy

Obsolete and wrecked planes are the "victims" of an electrically operated guillotine at the Norfolk, Va., Naval Air Station. Its 6100-pound cutting blade, made from two thicknesses of two-inch armor plate, drops 26 feet to slice aircraft



Tail section of plane, left and above, is completely cut off by guillotine's huge blade crashing down at speed of 40 m.p.h.

into sections for speedier salvage handling. The sections are smelted down to aluminum ingots for sale to buyers throughout the country. Inside width of the tower is 17 feet, large enough to handle everything up to the size of seaplane hulls. The guillotine operates on 16 planes daily, making it four times faster than the former method of cutting the scrapped aircraft hulls with a torch.

TORPEDO SPEEDWAY



Arrow marks a torpedo launched from 300-foot tube running down a hillside at Morris Dam range

"THE NEXT SHOOT will be an experimental torpedo beefed up to take the shock and fired at a speed far greater than it could be launched from a standard torpedo plane!"

There was a warning blast from the air horn and then, two seconds later, a giant splash in the surface of the quiet reservoir. Barely visible underwater, the dim shape of the torpedo sped down the range and then bobbed quietly to the surface.

Its underwater progress had been measured by motion-picture cameras pointed down toward the surface, by underwater cameras and by hydrophones that picked up the sounds from dynamite caps that were exploded one at a time inside the missile. These records would enable the

Left, fast revolving steel balls are shot into a tank to get hydrodynamic data. Below, nose of test torpedo breaks water



underwater ballistics experts to determine the exact path that the torpedo followed.

The experimental torpedo carried no war head or propulsion motor. It had been launched into the water from the open mouth of a 300-foot-long tube by a charge of compressed air. The shoot had been made to study the effect of high-speed water entry upon that design and to learn whether the torpedo would run true or would hook or broach to the surface.

Ever since 1943 the Navy has been quietly conducting research in torpedoes and underwater missiles in an eight-mile-long reservoir behind Morris Dam near Azusa, Calif. During the war more experimental torpedoes were launched into the reservoir than the total number that was fired from aircraft against Japanese targets. The information acquired from the tests contributed greatly to the accuracy of our air-launched torpedoes during the latter part of the war.

Today at the same reservoir the Navy is expanding its research program. Modern designs of high-speed torpedo aircraft, for instance, impose new problems on designing and shaping of torpedoes and there are numerous new ideas concerning under-

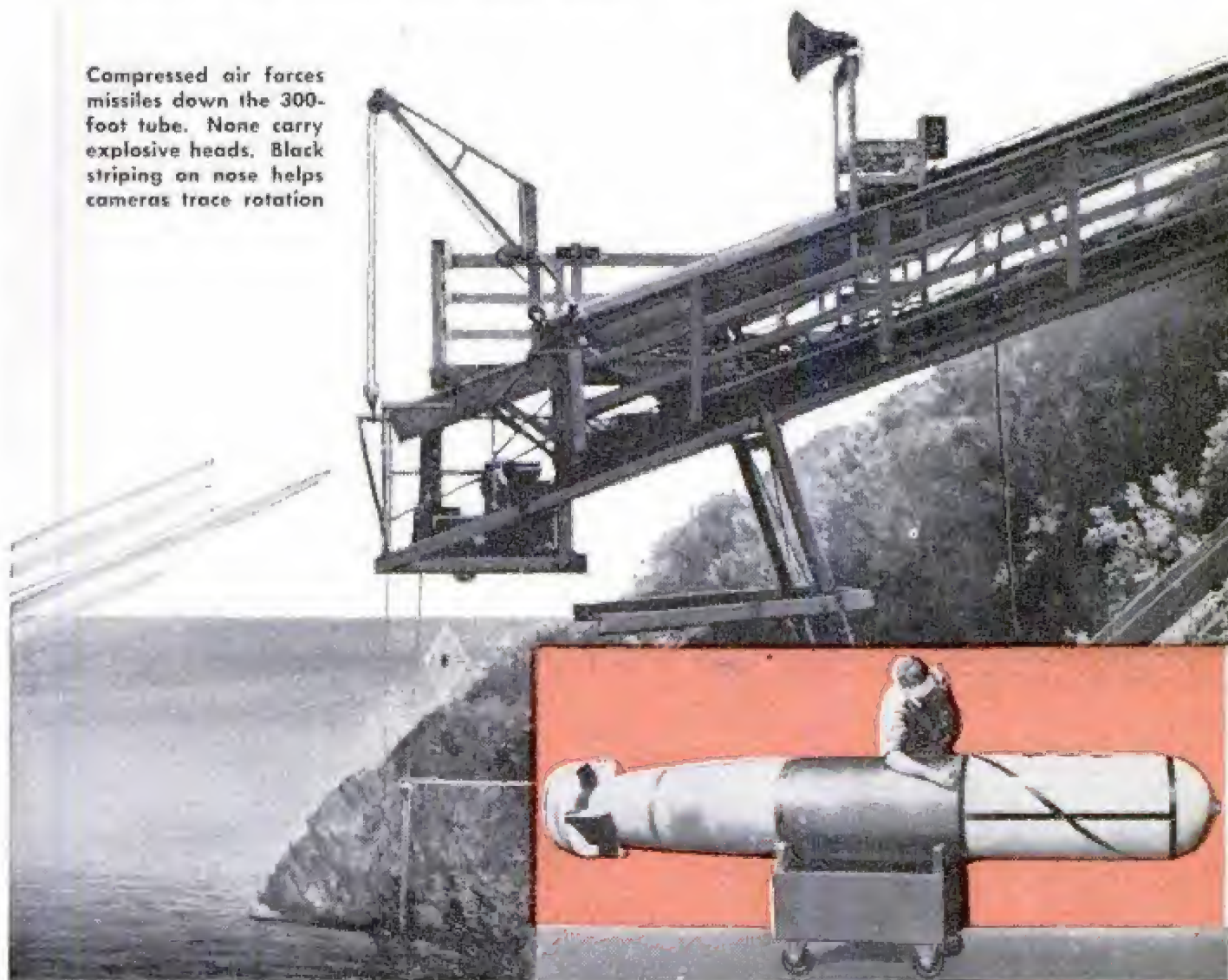
water missiles that must be investigated.

The launching tube now in use slants down the side of a hill to the water surface at a fixed angle of 19 degrees. Compressed air blows the torpedo down the tube, through the air and into the water when the firing officer pulls a valve. In the water the torpedo travels along a buoy-marked course and, when the missile is equipped with a propulsion motor, toward a white target at water level a mile away.

Basic data on water-entry problems are studied not only by the launching of torpedoes but also by the launching of so-called plugs down the tube. A plug is a 300-pound hollow aluminum shape, similar to the nose of a torpedo. It strikes the water with such force that it is shattered into hundreds of pieces, many of which fly through the air with the force of shrapnel.

Not only must the effects of speed in hitting the water be studied but the angle at which a missile is dropped into the water is also important. To learn more about the best angles for dropping missiles from aircraft the Navy is now completing a variable-angle launching tube that, with its supporting structure, looks like an engineer's weird dream.

Compressed air forces missiles down the 300-foot tube. None carry explosive heads. Black striping on nose helps cameras trace rotation





Left, now under construction, variable-angle launcher will test best speeds and angles for planes to drop missiles. Right, from water's surface to top of cableway for the torpedo speedway is 220 ft.



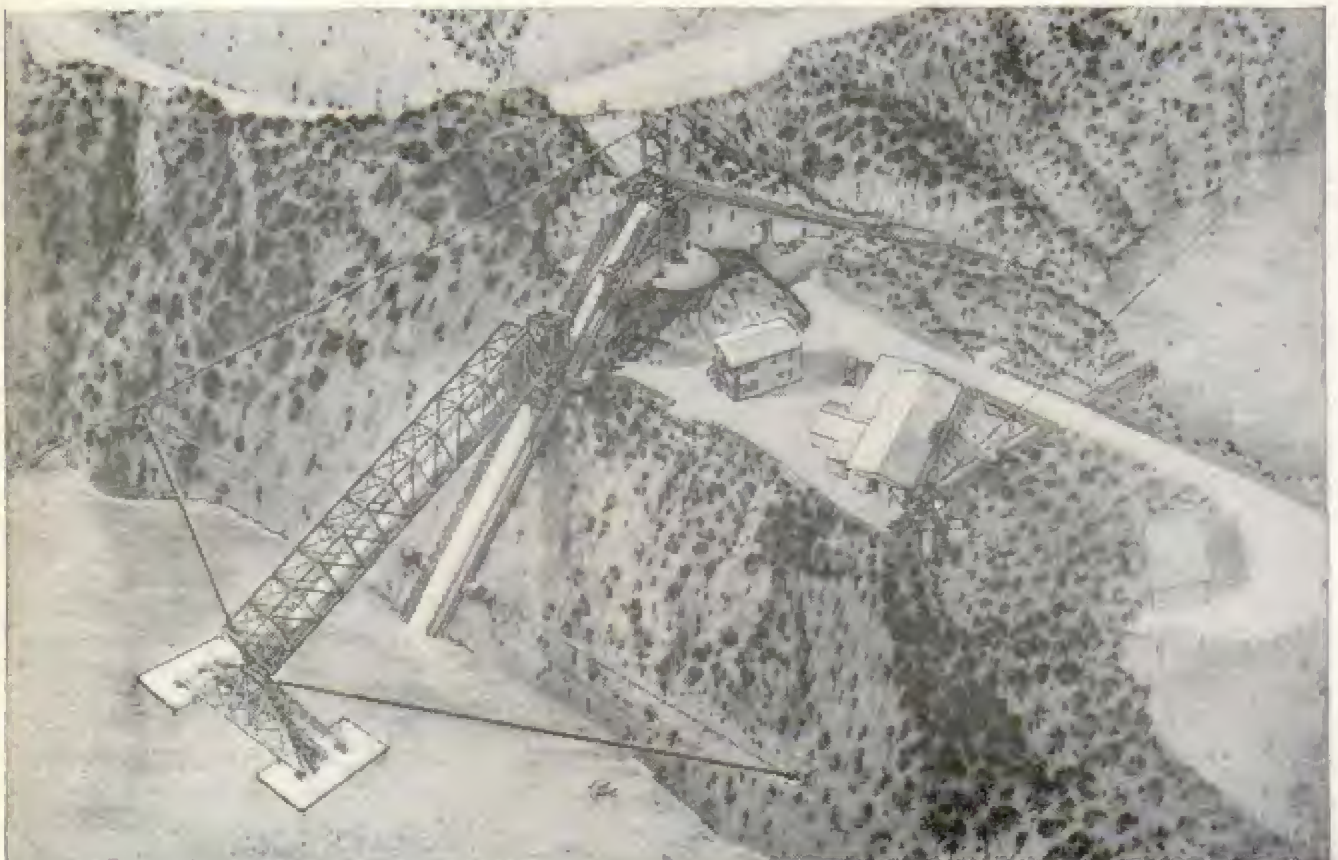
Tube for the variable-angle launcher is in bridgelike member. It is held in place by steel cables attached to counterweight that slides up and down concrete runway on the far side of the hill

The tube itself is 300 feet long. It is supported inside a welded-steel bridgelike structure, one end of which rests on floats on the surface of the reservoir and the other end of which is hauled up a steep concrete runway built into the side of a hill.

A huge wheeled car that may be loaded to a weight of 600 tons is positioned on a similar runway on the other side of the hill to act as a counterbalance, being joined to the launching tube and structure by means of sixteen $2\frac{1}{8}$ -inch extra flexible strands of wire rope that are led up over the crest of the hill. Because of this counterbalancing it will be possible to haul the free end of the launching tube uphill by means of a single 100-horsepower electric motor.

The Morris Dam experimental torpedo range operates as a

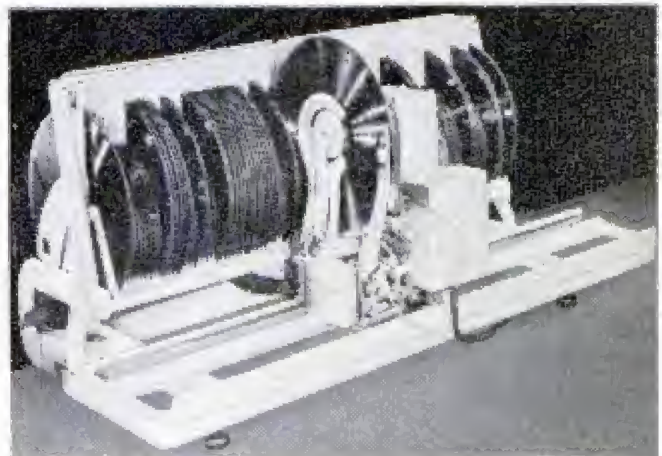
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"Marathon" Phonograph

More than 14 hours of continuous music can be played on a new record changer without repeating a selection and without touching the records. The changer removes the record from the library, plays it on a vertical turntable and returns it to the library. Records are stored in a rack which holds 100. By pushing buttons beneath the records the operator can select the program he desires and the turntable and pickup arm move along a track to play them. Both sides of a record can be played on the vertical turntable without turning the record over. One model of the changer is designed for homes and small installations. It is available either with or without an amplifier and speaker, and may be



played over existing sound systems or through any radio set. A model for industrial use has a microphone for making announcements throughout a building.

Billions of Bees Shipped to Northern Orchards in Wire Cages

Six billion baby bees were shipped this spring from southern states to northern destinations where they replaced colonies killed during the winter. According to the Department of Agriculture, 1,375,000 pounds of bees were shipped in 1947, and this year's shipments were about four percent higher. Although the bees are only a week old when they leave the South, they

go to work immediately after reaching their destination, producing honey and pollinating fruit trees in northern orchards. Package bees travel in wire cages and are fed syrup during the trip. Some packages contain a queen, although queen bees are also available in individual cages. More than a million queens were shipped in 1947 and even more in 1948.



With arresting gear picked up by the tail hook, jet is being slowed to stop on flattop. They come in at speeds above 100 miles an hour

Left, with its jet engine roaring, an FJ-1 is catapulted from bow of USS Boxer. At this position plane's speed is about 130 miles an hour

Lower left, jets require a longer approach glide than piston-engine craft because they get no braking effect from propeller on way down

Below, as emergency stopper for those that fail to catch arresting gear, Davis barrier rigging snaps up to halt the main landing wheels



ROOST ON A FLATTOP



North American Aircraft photo

With nose gear "bending at the knee," an FJ-1 nears upright position where it'll lock into its normal place

PREPARING for the day when all Navy carrier-based planes will be jets, pilots of Squadron VF-5A, "Fighting Able Squadron," have been using the 800-foot-long USS Boxer for operational tests off the Pacific Coast.

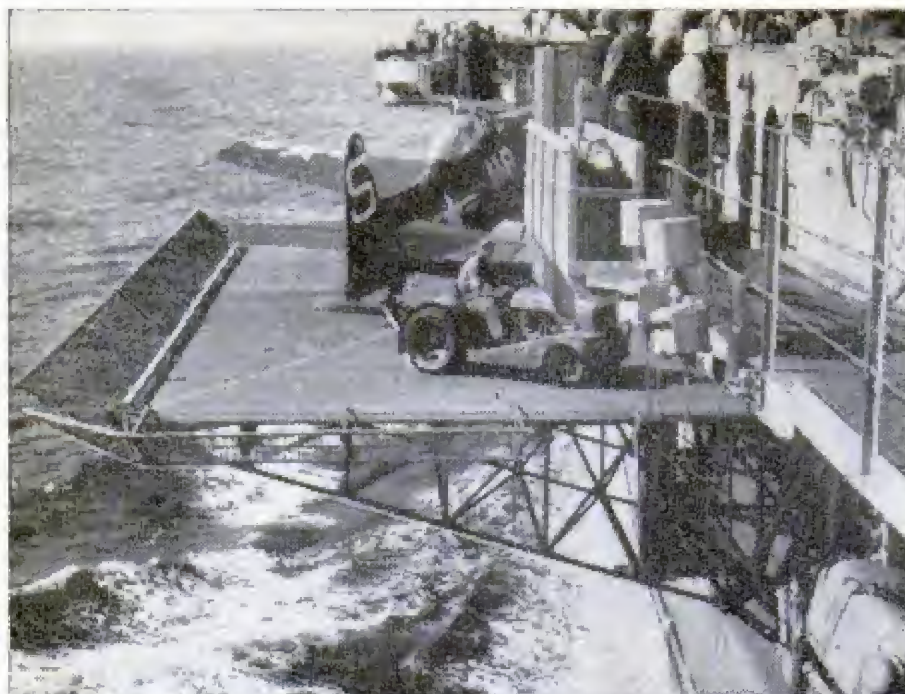
Purpose of the flights is to explore the need for possible changes in carrier design to accommodate jets, as well as to give pilots practice in jet landings and take-offs at sea. The Boxer trials were preceded by months of practice on a small field near San Diego, Calif., which simulated the deck of a carrier and was equipped with arresting gear.

The squadron's North American FJ-1 Furies weigh 12,697 pounds, have a top speed above 550 miles an hour, carry six .50-caliber machine guns and have a range of more than 1500 miles. With short, stubby wings, the FJ-1 looks like a high-flying bomb. In place of folding wings it has a "kneeling wheel" that lowers the front part of the plane and raises the rear of the fuselage so that other aircraft can be parked close behind on crowded carrier decks.

One change necessary on the carrier was the installation of a Davis barrier, designed as an emergency stopper for jets that fail to engage the arresting gear. It consists of

Rows of radio antennas, usually sticking up in the air, have to be cranked down when planes are landing





Left, side elevator takes jets from hangar deck below, where fueling, servicing and inspection are performed, to flight deck

Four Furies fly over the Boxer just prior to landing. This type plane made its initial flattop landings during Pacific trials



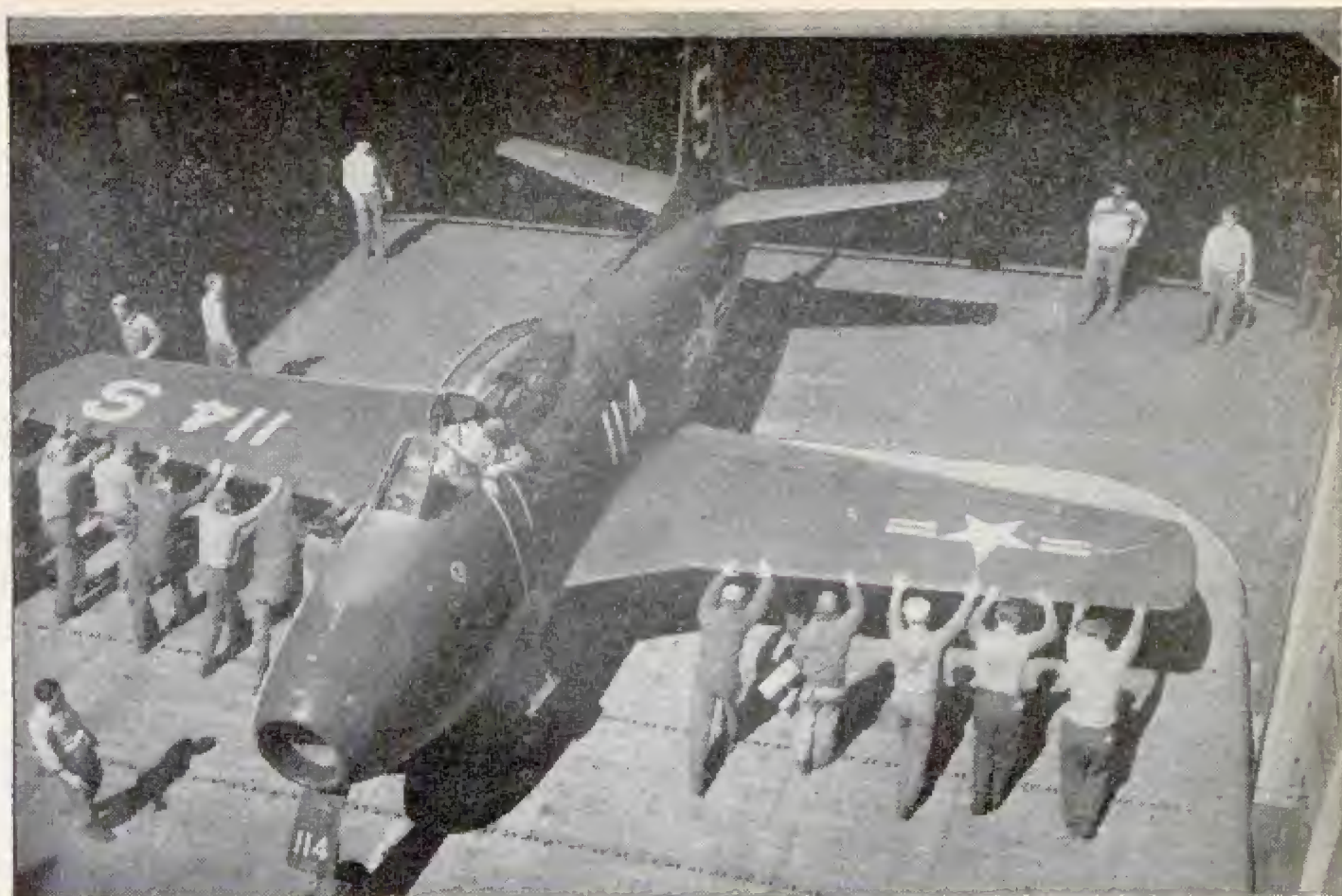
a heavy Nylon rope stretched 3 feet high across the deck. When the rope is struck by a nose wheel, a heavy steel wire immediately snaps up in front of the plane's main landing wheels, stopping them. The barrier design change was necessary because the FJ-1s and other jets are of the nose-wheel type.

In the test operations, pilots were able to snag the first or second wire of the arresting gear for landings, often with rolls of only about 60 feet. To make up for the lack of braking effect supplied by propellers, the pilots began their approach glide about 200 yards sooner than is customary with piston-engine fighters. They were landing at a little less than 110 miles an hour after most approaches.

Take-offs were made a few times within 700 feet of the deck's length, but most of the time planes were put in the air from catapults built into the forward part of the deck. On some fly-offs the jets used about 800 feet, meaning that the entire deck had to be cleared. A piston-engine aircraft needs only the forward half or third of the deck, allowing storage of a considerable number of aircraft behind it.

Catapulting, on the other hand, requires only a limited space in the bow and allows considerable deck storage space for additional planes. The indications are that aircraft carriers on which jets are based will be redesigned to provide for more than two deck catapults, or to allow catapulting

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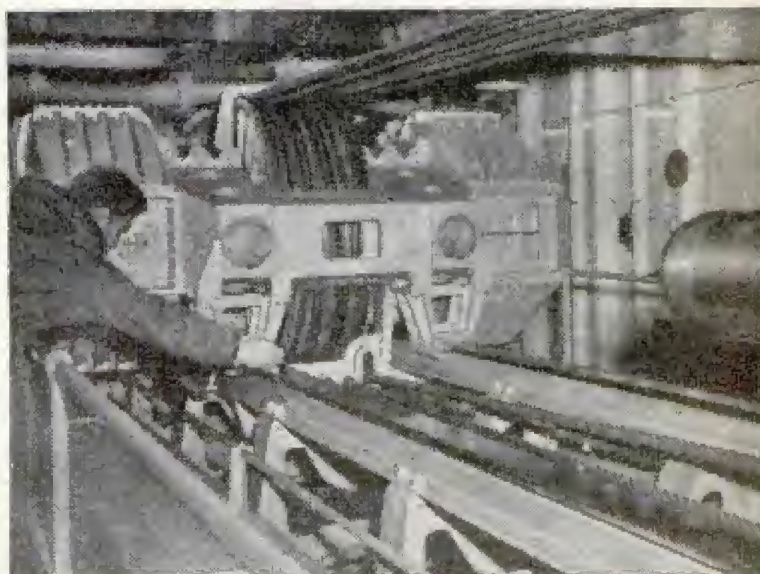


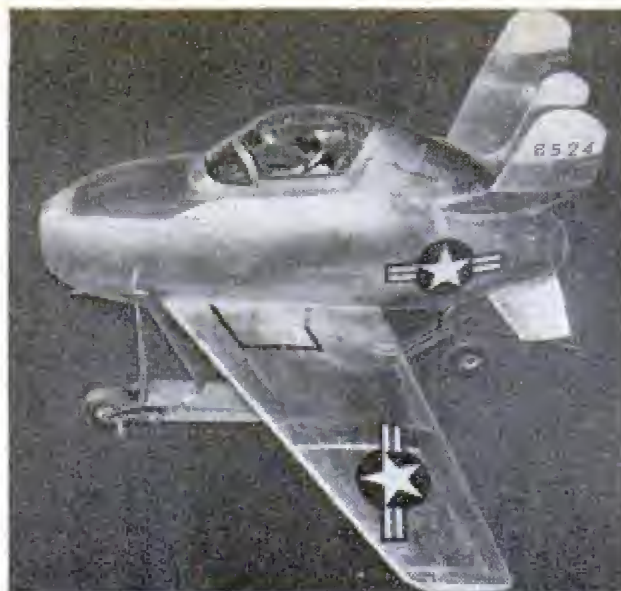
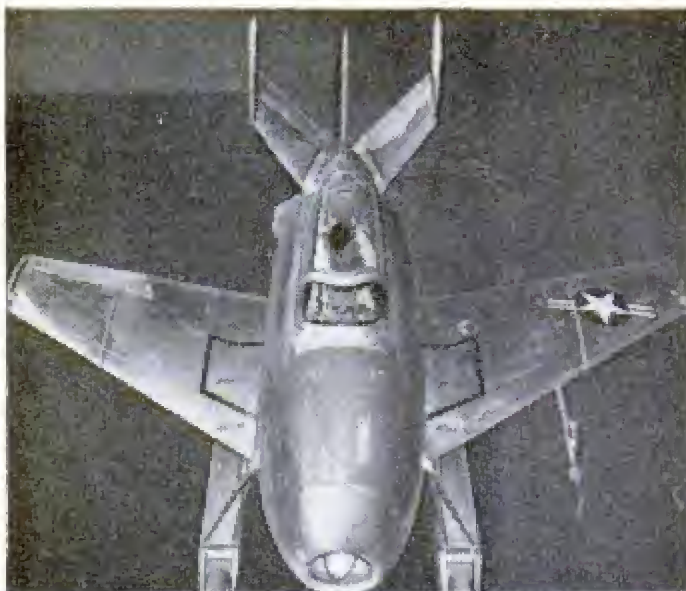
Flight operations are speeded by using the deck elevator, above, for hangar-bound craft, side elevator for planes about to fly

Right, carriage over which catapult cable is strung travels only nine feet before it is halted by buffer pistons, like one at right

Lower right, preparing to catapult jet from carrier bow. With its pull and help from wind, plane leaves deck at about 130 m.p.h.

Below, sailor attaching a catapult rope to shuttle that travels along 90-foot slot in deck. Rope cable falls free at end of run

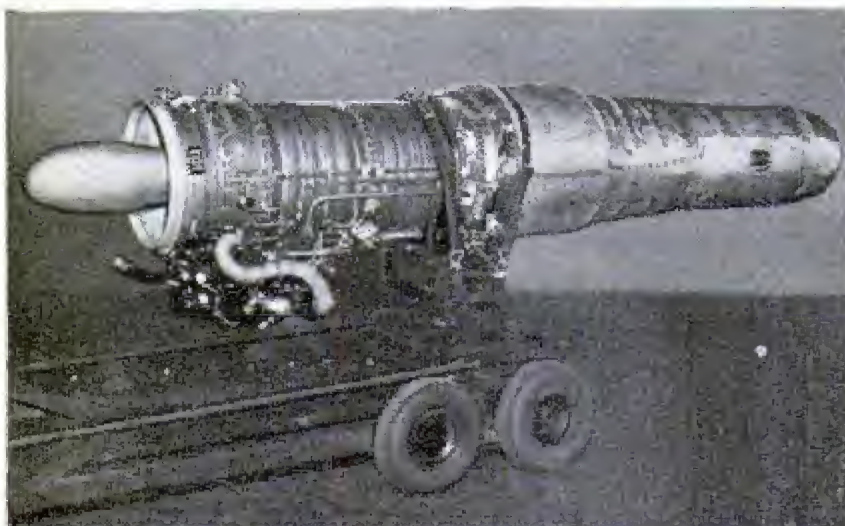




Above, odd-shaped tail assembly of the stubby XP-85 was necessary to provide maximum stability and still fit in bomb bay's tight space

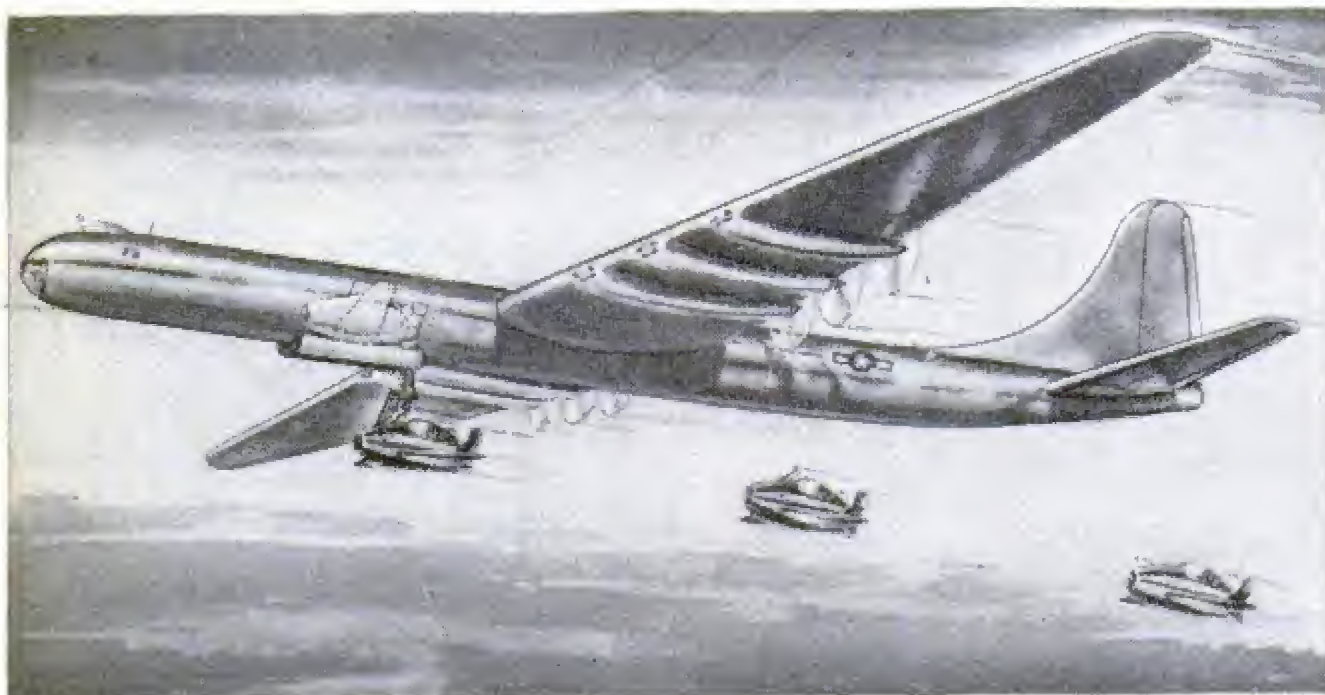
BOMBER CARRIES JET FIGHTERS

One of man's most spectacular dreams, fighter planes that ride to and from battle inside long-range bombers, has become a reality. Called the XP-85, the U. S. Air Force's tiny jet "parasite" travels faster than 600 miles an hour. Unlike other fighters, it will only have to carry enough fuel to fly during the brief moments of actual combat, and none for the long trips to and from the target. The deadly mite is 15 feet long. The wings, spanning 21 feet, fold so that a mooring hook can bring the plane in and out of the bomb bay.



U. S. Air Force photos

Frontal area of XP-85 Westinghouse jet engine, above, offers least wind resistance and makes speed of over 600 miles an hour possible. Below, "parasite" fighters will be lifted in and out of bomb bays by a mooring hook. The McDonnell-built plane has no landing gear





Two Buses Plus Porch Make Attractive Home

When the housing shortage faced Pete McBride of Winston-Salem, N. C., he built a cottage out of two discarded buses. McBride hauled the buses to his vacant lot and mounted them side by side on a concrete-block foundation. He added a front porch and a false front that resembles a bungalow to complete his home. McBride's wife has windows lining the walls on all four sides of her new house.

Top, the discarded buses were mounted side by side and a false front was added. Left, the bedroom has plenty of windows



Prefabricated Roofs

Prefabricated roofs that can be easily transported and erected to form open sheds are being manufactured by British firms. The metal roof is supported by a tubular framework. Beneath the outer shell is an inner roof, providing an insulating space required in tropical climates. The roof will be used in British developments in Africa including a project to grow nuts on 3,250,000 acres.





No two look alike, but the engine of each is souped up to deliver as much as twice its original power

Detroit never satisfies them

**The "hot rod" fans are always taking
their stock cars apart and souping them
up for faster and more economical travel**

THERE are hundreds of passenger cars on the road today that can do an honest 90 or 100 miles per hour, get upwards of 25 miles per gallon of gas at highway cruising speeds, and can outperform any stock car on the market.

Most of these automobiles are completely conventional in appearance—but you whistle with surprise when you raise the hood. Inside is a chrome-plated engine, festooned with special carburetors and manifolds. The creation looks like a racing engine and that, in essence, is what it is.

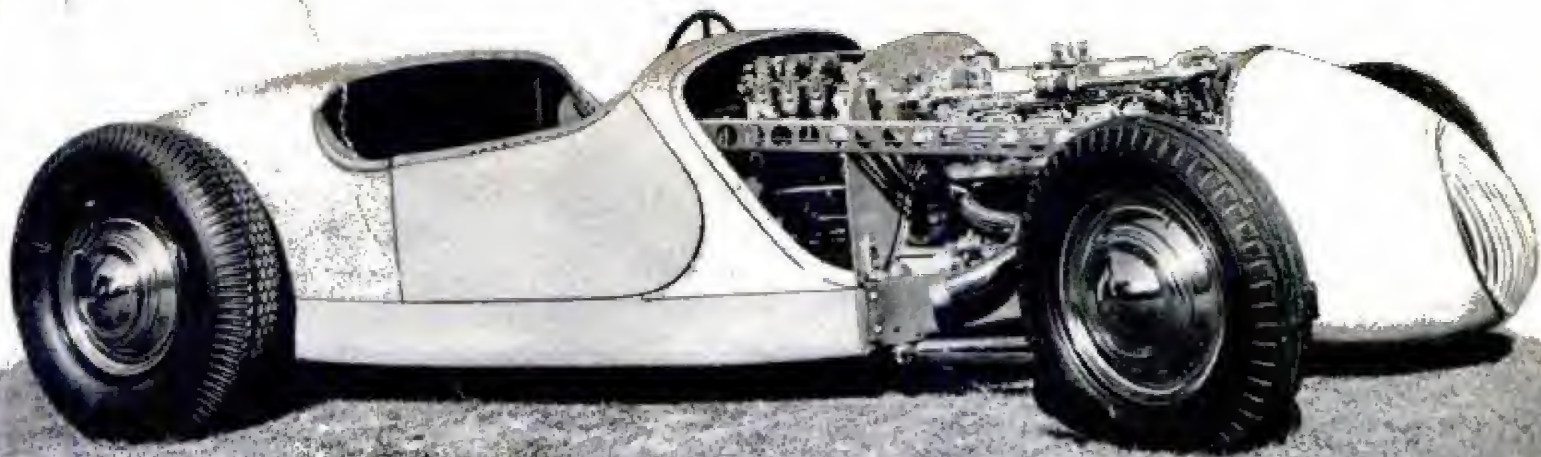
Rebuilding and reworking stock engines to deliver as much as 170 percent or more of their original horsepower has been a fascinating hobby among amateur automotive engineers. "Hot rod" enthusiasts spend thousands of hours designing and building engines to their own specifications, then installing them in ordinary cars or in

special jobs that are lightened and streamlined for speed.

The sport had its start early in the 1900s when some of the owners of newfangled horseless carriages got together for road races and endurance runs. The owners who hired mechanics to tune up their engines soon had their own heads under the hoods and were starting to tinker.

In the early '30s, in southern California, automobile drivers found that on the flat pavements of dry lake beds in the desert they had ideal proving grounds for testing their car speeds, and they have been using the dry lake beds ever since. The first reworked cars were clocked at around 70 miles per hour, then the speeds started going up and today the record stands at 140 miles per hour.

Three hundred or more cars may be entered in one of the time-trial meets now



Speed car with all-aluminum body, ready to be fitted with windshield or a transparent bubble-type canopy

held several times a year on a dry lake bed by the Southern California Timing Association, with 10,000 or more spectators in attendance. Most of the cars are roadsters, divided into classes according to engine specifications. A special streamliner class is unlimited, both as to body and engine specifications. Prizes are awarded in each class for the fastest average of two runs, one in each direction.

Last winter the S.C.T.A. held a three-day exhibition in Los Angeles of some of the best looking cars, and no group was more surprised than the drivers themselves when an estimated 50,000 people turned out to examine the hopped-up engines and the special chromed and painted chassis and bodies. Now the S.C.T.A. is thinking about a national organization that would conduct and govern local speed tests in other parts of the country, wherever there are enough interested owners. Today this hobby is developing into an industry and there are a dozen or so manufacturers who are building special manifolds, high-compression heads, and other equipment for drivers who want more speed or economy.

Police cars use the converted engines for speed and power. Taxi fleets equipped with rebuilt engines are able to save on gasoline, and commercial-vehicle operators find that they can move heavier loads without loss of speed when engine horsepower

↓ Roadster with V-8 engine, running "wide open" in a time trial, has been clocked at 125 miles an hour

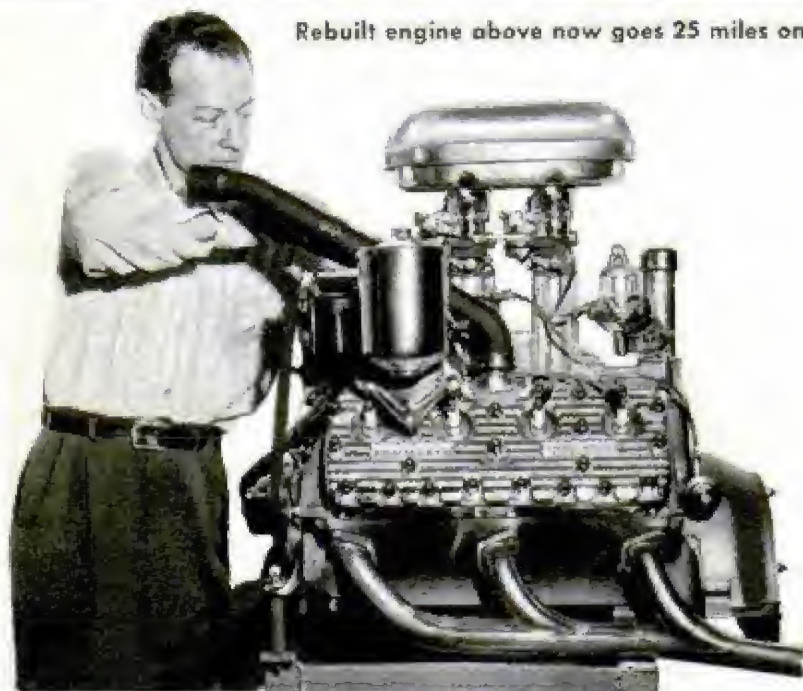


Owners like the one above spend thousands of hours installing disk brakes, rebuilt springs and shocks





Rebuilt engine above now goes 25 miles on gallon of gas



Typical V-8 revamped for more power and economy, above, has twin carburetors and reworked ignition



is increased. Scores of private owners and hot-rod enthusiasts soup up their engines simply because of the greater performance that they obtain. Trailer-coach owners find that they can maintain better highway speeds when towing a trailer and can climb grades in higher gears when they rework their engines to produce more horsepower. Boiling the radiator is still a common problem on a long pull in the mountains, however, and one driver solved this by attaching an electric fuel pump with a very small orifice in front of his radiator. With a special one-gallon reservoir of water, the fuel pump now sprays water over the radiator and helps keep it cool by evaporation whenever the driver turns the special switch on his instrument panel.

Special equipment that provides about 20 percent more horsepower costs \$200 or less. For around \$500 an engine can be radically reworked to deliver a 70-percent power increase on premium fuels. Some of the extra power is obtained by increasing the efficiency of the engine, which in turn results in more miles per gallon under normal driving conditions. The conversion equipment is available for various popular makes of 6 and 8-cylinder engines, although most manufacturers confine themselves to equipment designed for Fords and Mercurys, the engines on which most experimental work has been done.

Ten percent or more power is obtained merely by adding one carburetor and a special manifold that insures an even and adequate flow of fuel at a high number of revolutions per minute. When this installation is combined with a high-compression head of about 8 to 1 a power increase of around 20 percent is obtained, equal to 3 or 4 additional miles per gallon with normal driving. In one 1500-mile test run that included speeds of up to 75 miles per hour an engine converted in this way is said to have averaged 22.3 miles per gallon of gasoline.

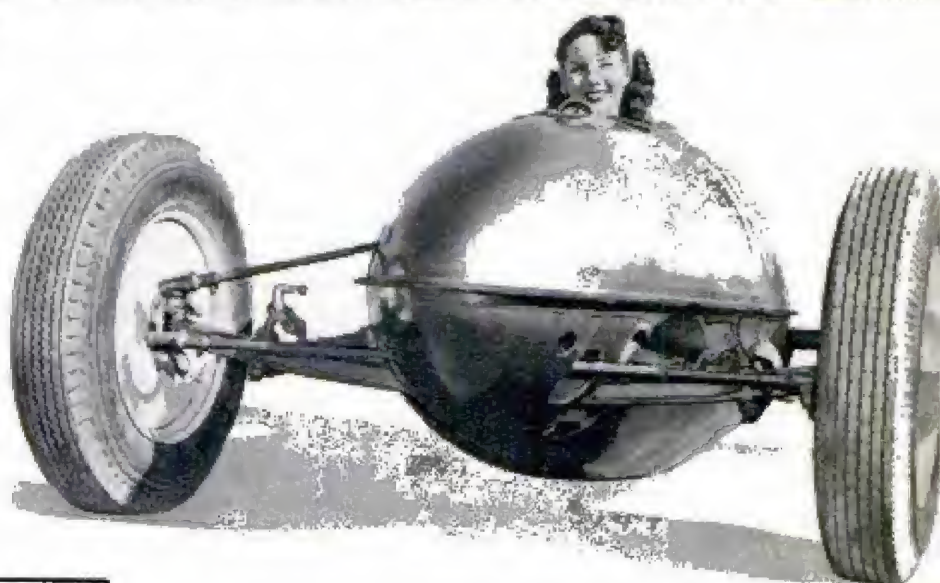
Most of the conversions include a reworked ignition system that produces a hotter spark. Usually, double coils and double condensers are used, as well as

Left, block with cylinders bored (3) to take $3\frac{1}{2}$ -inch piston, considerably larger than stock size being held in piston. White ring chalked around intake port (1) reveals how its diameter will be enlarged. Whitened area of combustion chamber (2) indicates where metal will be removed to allow an easier flow of gases into and from the chamber to the valves

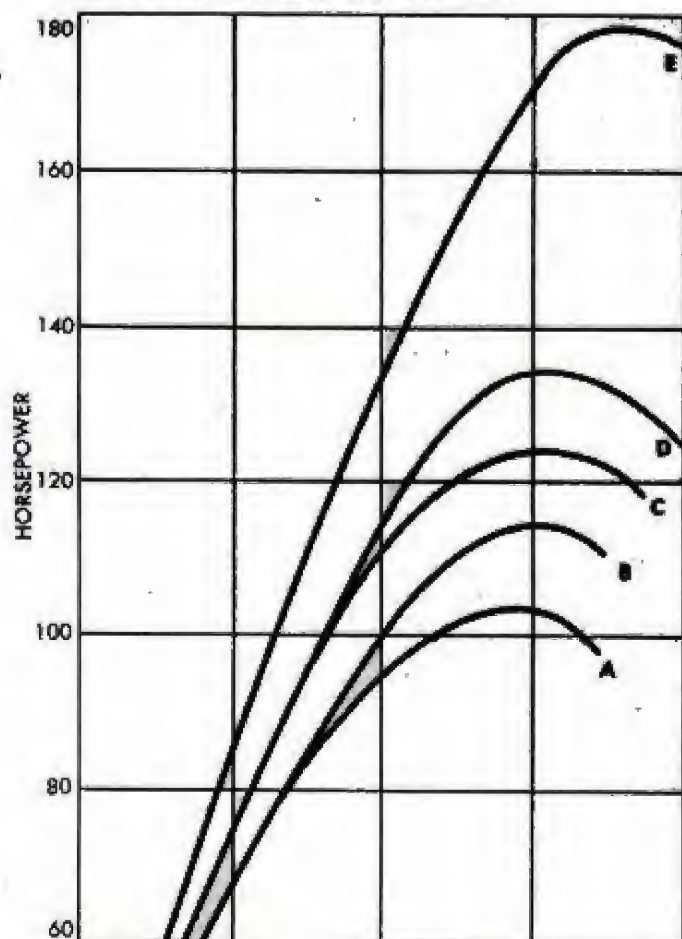


Above, an airplane belly tank mounted on Ford frame, this streamlined "hot rod" has topped 139 miles an hour

Right, belly-tank Ford has a six-inch drive shaft, an inverted Mercury motor in the tail and is steered with a stick



Curves A to E in graph below indicate horsepower increases for 100-hp. Ford engine at various stages of souping up process. Curve E represents power gain after engine was completely reworked
Dynamometer chart compiled by Vic Edelbrock



fast-action distributor springs and magneto-type breaker points. A good rebuilt ignition system will jump a $\frac{1}{2}$ -inch spark at 8000 r.p.m. and will operate at compression ratios as high as 15 to 1. Stock ignition systems that are adequate at low speeds often can be improved for high speeds by using stronger or double distributor springs.

Members of the Southern California Timing Association and the other experimenters try out every idea that they can dream up in the constant quest for more power and efficiency. Some design "hot" manifolds to vaporize the fuel, others use "cold" manifolds that are intended to supply more fuel to the combustion chambers. Various compression ratios and various fuel mixtures of gasoline and alcohol are tested. One designer may like a small water jacket to insure a high engine temperature, while another may double the usual water capacity in the head so that the engine won't overheat even though he discards the fan.

Side-draft carburetion, double overhead



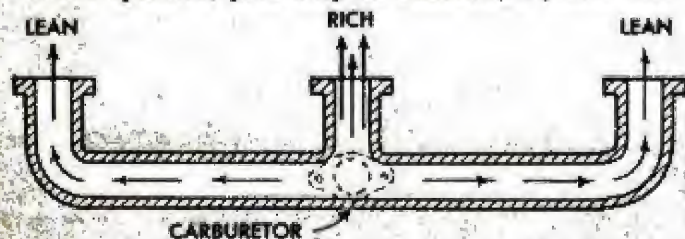
Young designer holds a fuel-injection system that replaces usual carburetor. Fuel metering changes automatically as butterfly valves open and close

intake valves coupled with a single exhaust valve in the block, pistons that push up into the combustion chambers almost to the roofs, water injection, supercharging, firing the cylinders of a V-8 in pairs, and odd firing sequences coupled with new designs of crankshafts; all of these ideas are tried and then adopted or discarded.

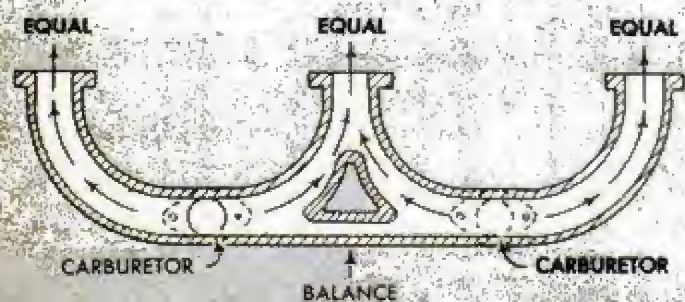
Four or five thousand hours of labor may

Drawings by Tattersfield Manifold Division, Electric & Carburetor Engineering Co.

Drawing of typical stock intake manifold, with each port feeding two combustion chambers of 6-cylinder engine. More fuel is supplied to the near cylinders than to the distant cylinders, producing an unbalanced power flow



This drawing shows dual carburetors and special manifold for the same engine, arranged so each cylinder draws an equal amount of fuel and performs equal share of the work. The open slot between the two carburetors is a balance tube that insures equal pressures



be spent on an engine and car and then, on its first run against time, the engine may fly to pieces. Most experienced hot-rod builders can point to a pile of junk behind the shop that contains smashed blocks, cracked heads, melted pistons and twisted connecting rods.

The most radical jobs, designed for high speed alone, are hardly satisfactory for highway driving. They are apt to be rough in the low-speed range and they wear out in possibly a tenth of the mileage that is expected from a stock engine. In some cases the horsepower is almost doubled.

To begin with, an entirely reworked engine is fitted with dual, triple or quadruple carburetors plus a special manifold. A high-compression head with a compression ratio as high as $9\frac{1}{2}$ to 1 may be used, plus race-type ignition. Weight of the flywheel is reduced or

else replaced by an aluminum flywheel.

The cylinders are bored out to greater diameter. Next the stroke is increased a full $\frac{1}{8}$ inch by grinding the crankshaft bearings off-center. Metal is removed from the inner surface of the bearing and the bearing is then reshaped, creating a longer stroke. Special "stroker" pistons, with pins set lower than usual, are installed. Next, a "super-race" camshaft that offers considerable overlap is fitted into the engine.

The diameter of the intake ports in the block are enlarged to permit an easier flow of fuel, and the combustion chambers are "relieved" by grinding away metal from the valve area to the cylinder. Stronger valve springs are installed.

All rotating parts, plus the connecting rods and pistons, are then balanced dynamically to within three grams.

The whole job costs \$500 or more, plus installation labor. Depending on the techniques used and the special equipment that is chosen, this reworking raises the power of a 100-horsepower engine to a total of from 165 to 185 horsepower. Hot-rod enthusiasts who use an engine like this on the highway are apt to find that they can accelerate so rapidly that they snap a rear-end gear or an axle. To forestall this they install truck components.

Instead of using standard carburetion, one young experimental engineer designed and built a fuel-injection system for a V-8 that operates on the continuous-flow principle. The fuel is sprayed under pressure directly into the intake ports above the valves. The air-fuel ratio remains constant

all through the throttle range. On its first trials an engine equipped with the injection system was clocked at 136 m.p.h. and the inventor is now trying further refinements to the equipment.

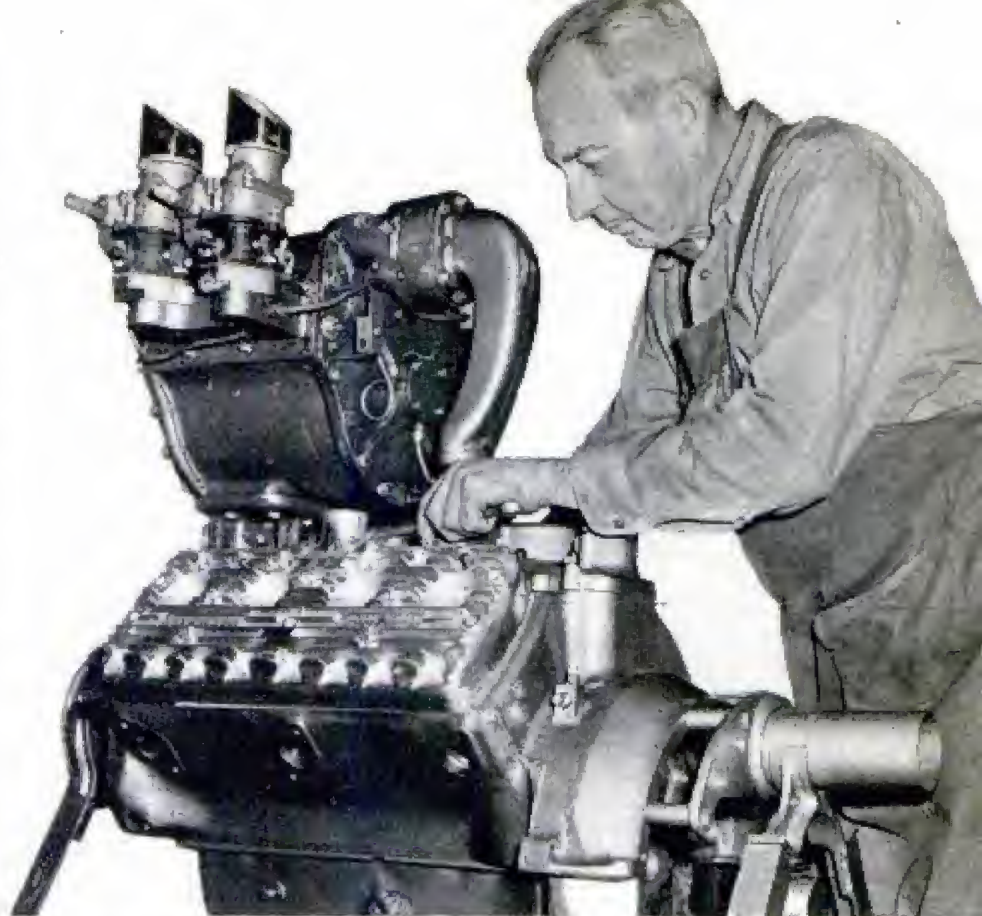
Another offshoot of hot-rod engineering is a rocker-arm overhead-valve system for jeep engines. Now in production, the assembly includes an aluminum-alloy engine head of 7 to 1 compression ratio, aluminum side plates and cover, and an optional single or dual water-heated manifold plus the overhead valves themselves. The installation can be made in a few hours and produces 80 horsepower at 4000 r.p.m.

Still another inventor has produced a simplified rear end that delivers power to each rear wheel at all times and yet has 100 percent differential. The rear wheels adjust their speed as usual in making turns and corners and yet each rear wheel has traction at all times, permitting one wheel to pull the other out of mud or across slippery pavement.

The superflexible springs and soft shock absorbers of stock cars provide a floating ride at low speeds but reduce a car's roadability on the highway, and this is another problem on which the amateur engineers are working. The ultimate, for cars built only for time trial runs, has been to bolt the chassis directly to the axles without any provision for ironing out the bumps, or at least to use only a skeletonized spring suspension. Such a car rides hard at low speeds but smooths out and remains stable at speeds in excess of 100 m.p.h.

It wouldn't be too difficult, some of the hot-rod enthusiasts believe, to design shock absorbers that are soft at low speeds and that automatically tighten up when speed is increased. A stock car equipped with such shocks should be easy to handle all through its speed range.

Many of the hot-rod enthusiasts think that Detroit is behind the times. But the fact is that the big manufacturers

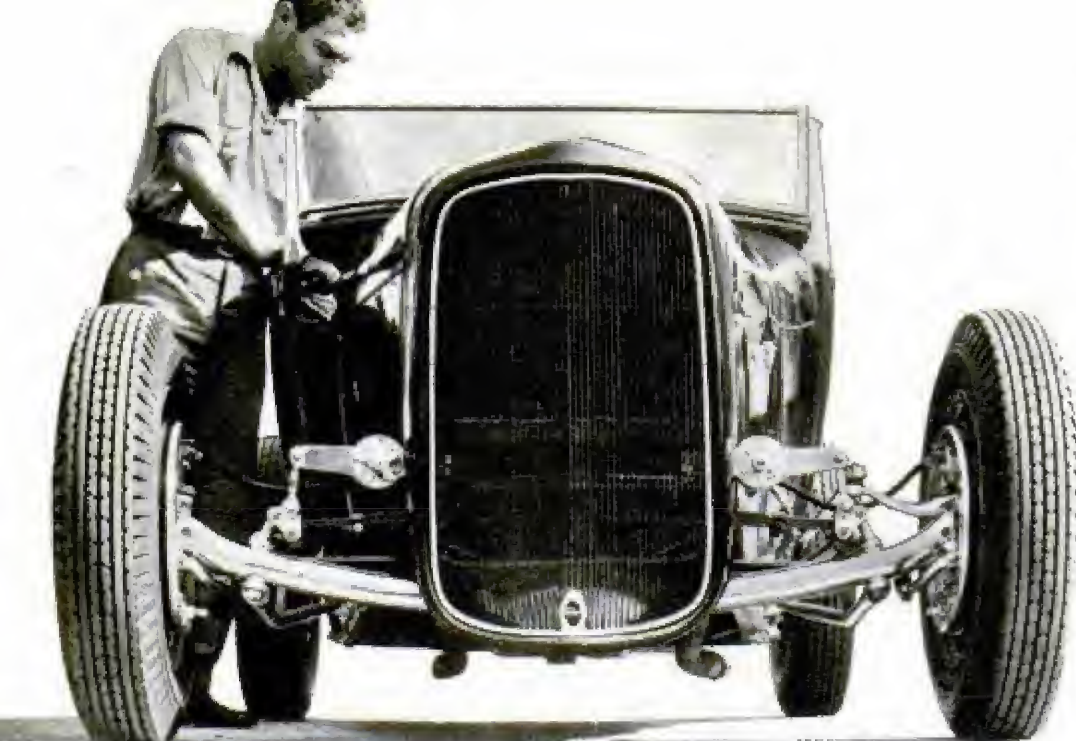


Horsepower of small V-8 is almost doubled by use of an experimental supercharger. Too bulky to install under hood of conventional autos, it is now being redesigned smaller

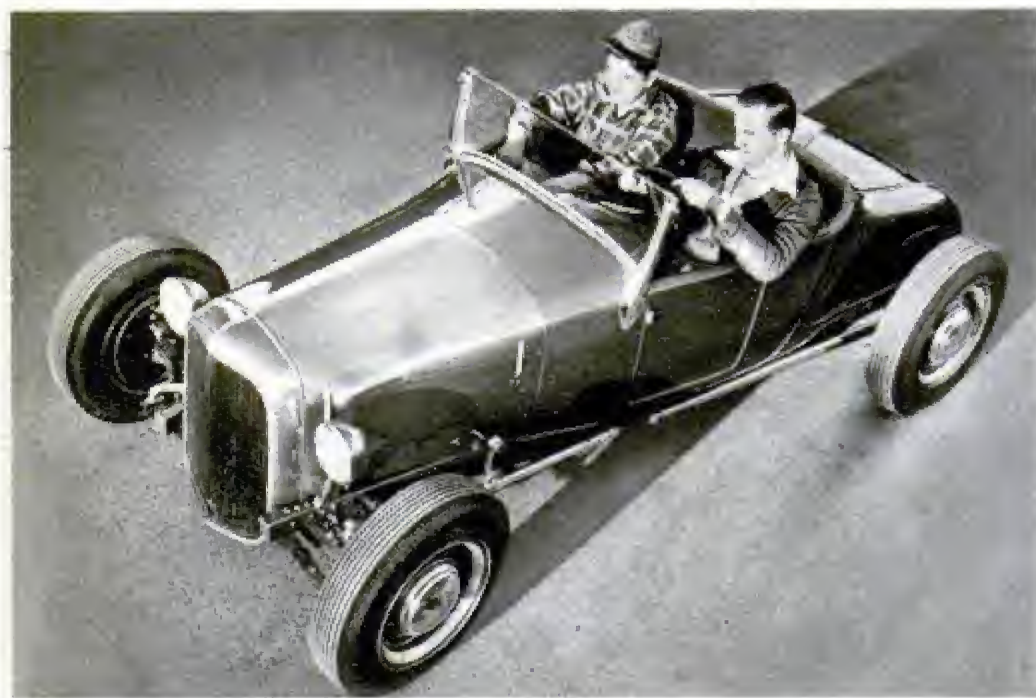


Bullet-shaped racer, above, buttons around driver so that only his head shows. Both side plate and steering wheel have to be removed for him to enter. Time car below has springs in rear, but none in the front

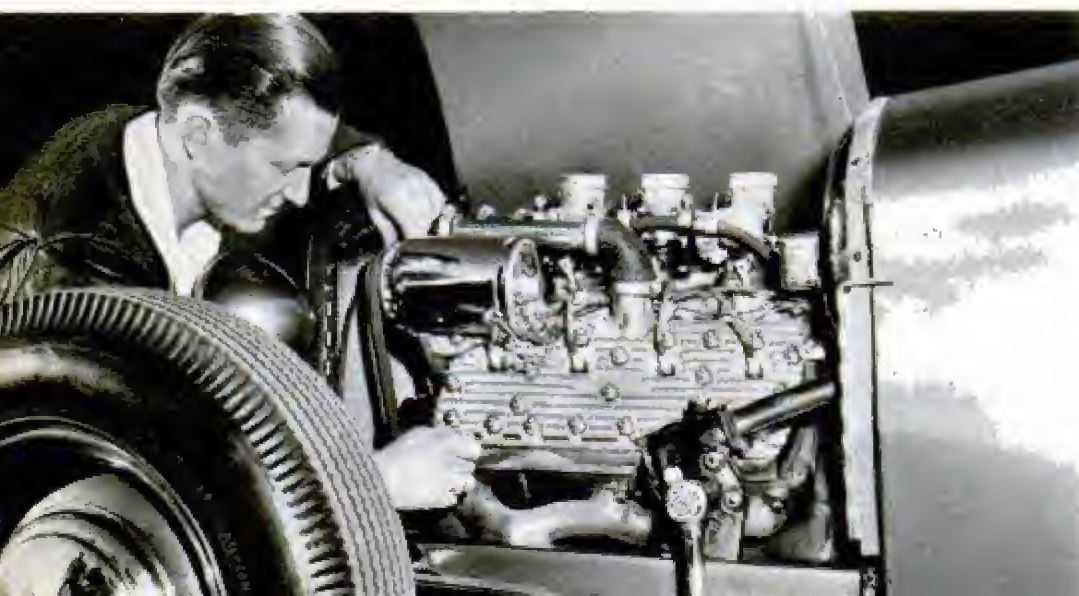




Tubular front axle is used on roadster, above, built up principally from 15 and 20-year-old Ford and Chevrolet parts. It was timed at 124 m.p.h.



Mercury-Ford combination, above, has 1927 body riding on a 1932 chassis. Below, souped up engine of this small roadster delivers over 150 horsepower



have problems that the amateur engineers don't appreciate. Detroit must build cars and engines that will operate satisfactorily for all kinds of people under a wide range of climatic, topographical and traffic conditions.

With all factors considered, it would be hard to improve on Detroit's mass-produced automobiles. It can be done, however, and the seriously minded amateur engineers point to various slight changes that they have been making to engines for a number of years that have only recently been incorporated in the engines that Detroit produces.

Along those lines, one of the principal objectives of the S.C.T.A. is to get its mechanically inquisitive members to develop both parts and improvements that can be used by the major automotive manufacturers.

Some of their recommendations that might improve present engines include the use of hard liners for cylinder walls, good enough for 100,000 miles of use; better points, better bearings, and better workmanship in the ignition distributor to provide more positive firing under all conditions; more uniform cooling of the cylinder block and head; and, in the case of some engines, slight design modifications in combustion-chamber design and porting. At a cost of no more than \$12 or \$15 per car, the amateur engineers assert, stock engines could be improved considerably in efficiency and resistance to wear.

In a sense, hot-rod enthusiasts are serving as vital test engineers for the entire American automotive industry.

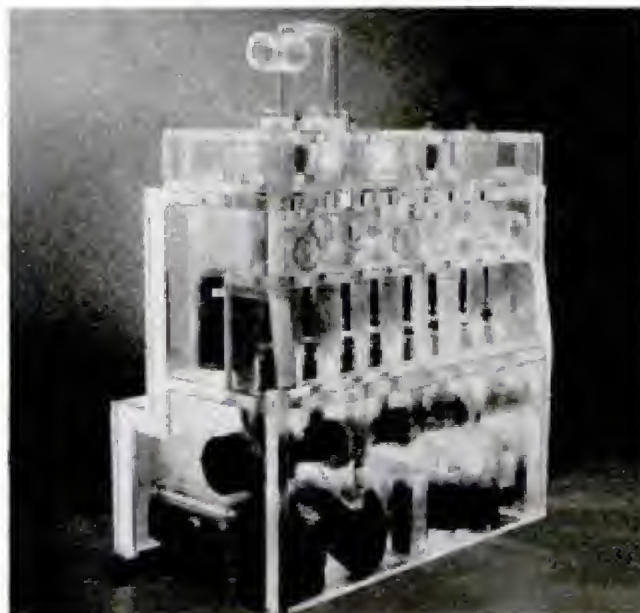
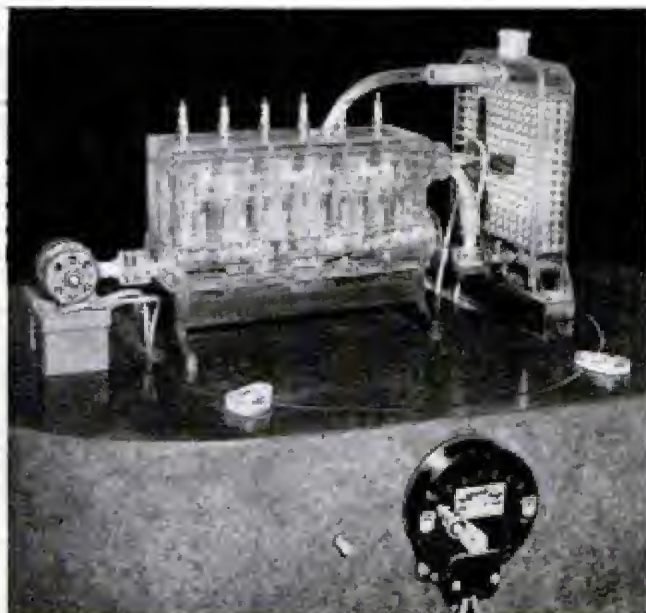
Plastic Parts Give Soldiers "X-Ray" View of Weapons and Engines

Transparent plastic parts permit soldiers at the Armored Center, Fort Knox, Ky., to watch the mechanism of weapons and motors in actual operation. Small arms parts that obstruct the view, such as the stock and outside plates, are accurately made of plastic and fitted to the weapons. Engines made almost entirely of plastic are used in training soldiers in the care and maintenance of vehicles. With a small motor attached to the drive shaft, the engines simulate actual operation to demonstrate the action and timing of valves and pistons. A complete cooling system is run by another motor. A small amount of air is left in the radiator so that the bubbles are visible as the water circulates.



Signal Corps photos

† Plastic stocks on weapons permit students to observe functions of parts. Below left, water circulates through cooling system of plastic engine. Below, transparent engine is built full size



Top of Low-Slung Italian Car Is Only 54 Inches Off Ground



Sleek lines are emphasized in the Cisitalia car, a sports coupe that is being manufactured in Italy. At its highest point the body stands only 54 inches from the ground and the front fenders project above the level of the hood. The car, powered by a four-cylinder high-compression engine, has a top speed of 100 miles per hour.

Names and addresses of manufacturers of new products featured in this issue will be supplied promptly by Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11

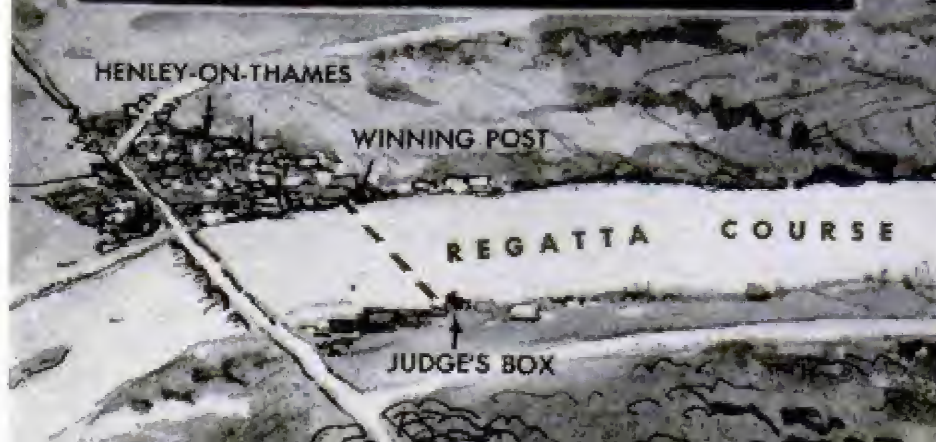
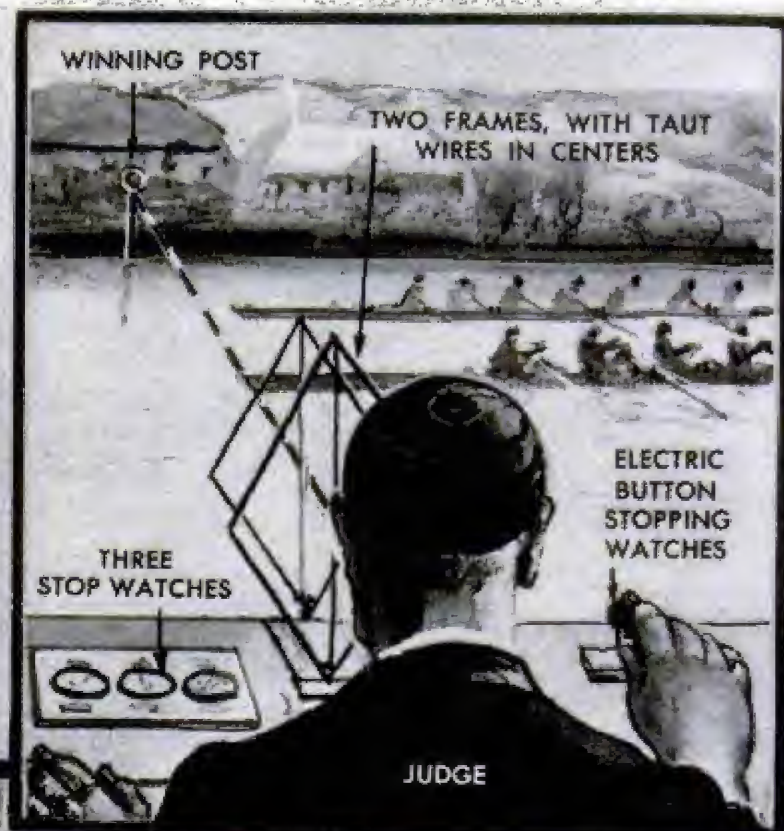
JUDGING THE OLYMPICS

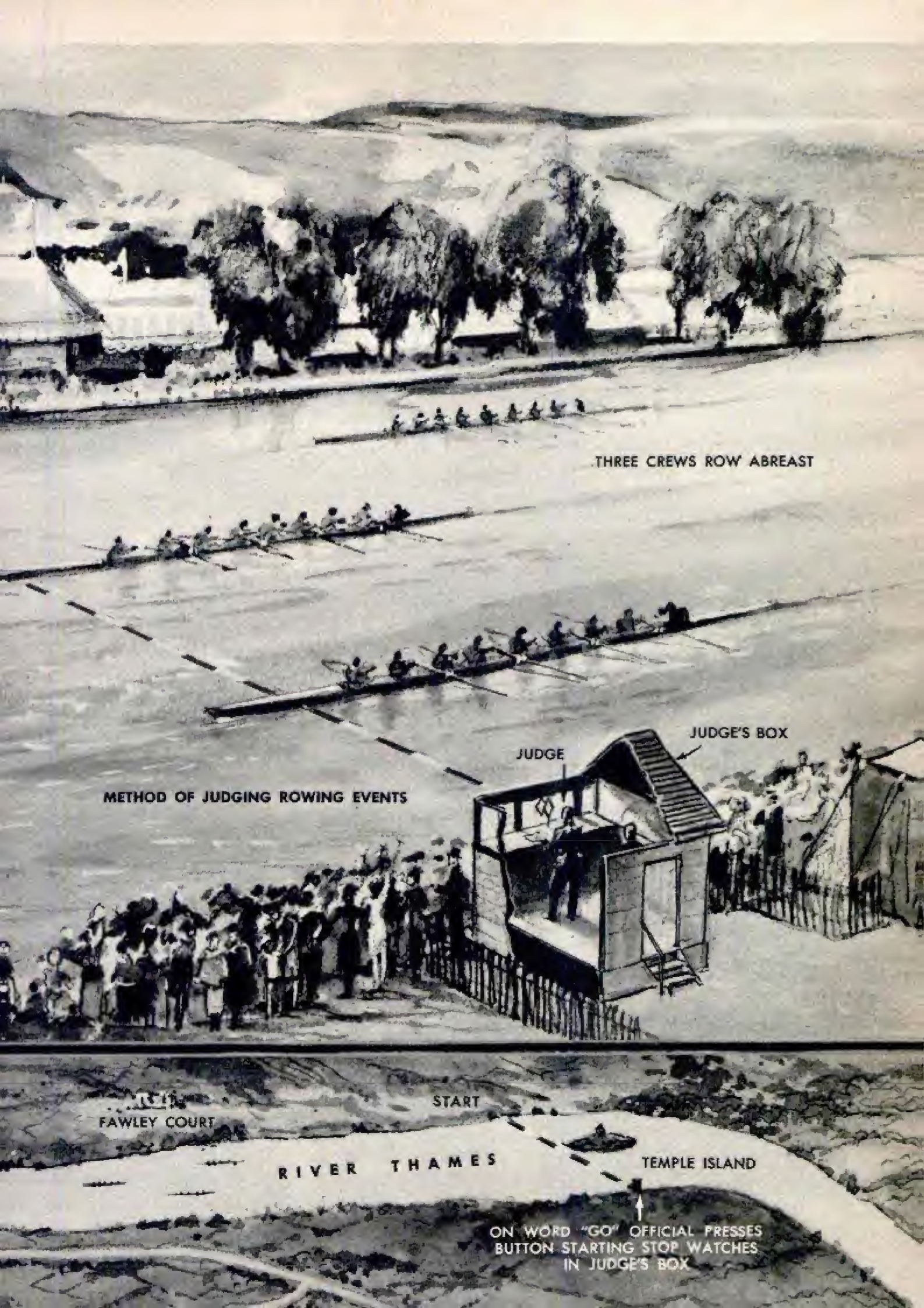
G. H. DAVIS, the noted English artist, was specially commissioned by *Popular Mechanics* to illustrate for its readers on these six pages the unique mechanical devices that will insure correct selection of winners at the Olympic games in London, July 29 to August 13. Unlike visual judgment, they won't be affected by tricky circumstances that often deceive the eye. In addition to photo finishes for the foot races, an electrical signaling system will register the votes of weight-lifting judges, and fencers will be "wired" so that every touche is automatically recorded. In the broad jump, where smoothness of the sand is an important factor in judging, a new leveling bridge and a measuring gauge, both riding on rails, will be used. The sand will be dusted with blue powder to emphasize the jumper's heel marks.

From a box 10 feet above the surface of the Thames, the crew-racing judge will "sight" the finish through a pair of diamond-shaped frames. Pressing a button at his right will halt a stop watch, set in motion by signal from the starting mark, as each crew finishes



AS FIRST BOAT CROSSES LINE THE JUDGE, SIGHTING THROUGH FRAMES, PASSES BUTTON STOPPING WATCH, REPEATING AS EACH CREW FINISHES. THIS RECORDS EACH BOAT'S TIME AND MARGIN BETWEEN THEM





THREE CREWS ROW ABREAST

METHOD OF JUDGING ROWING EVENTS

JUDGE

JUDGE'S BOX

FAWLEY COURT

START

RIVER THAMES

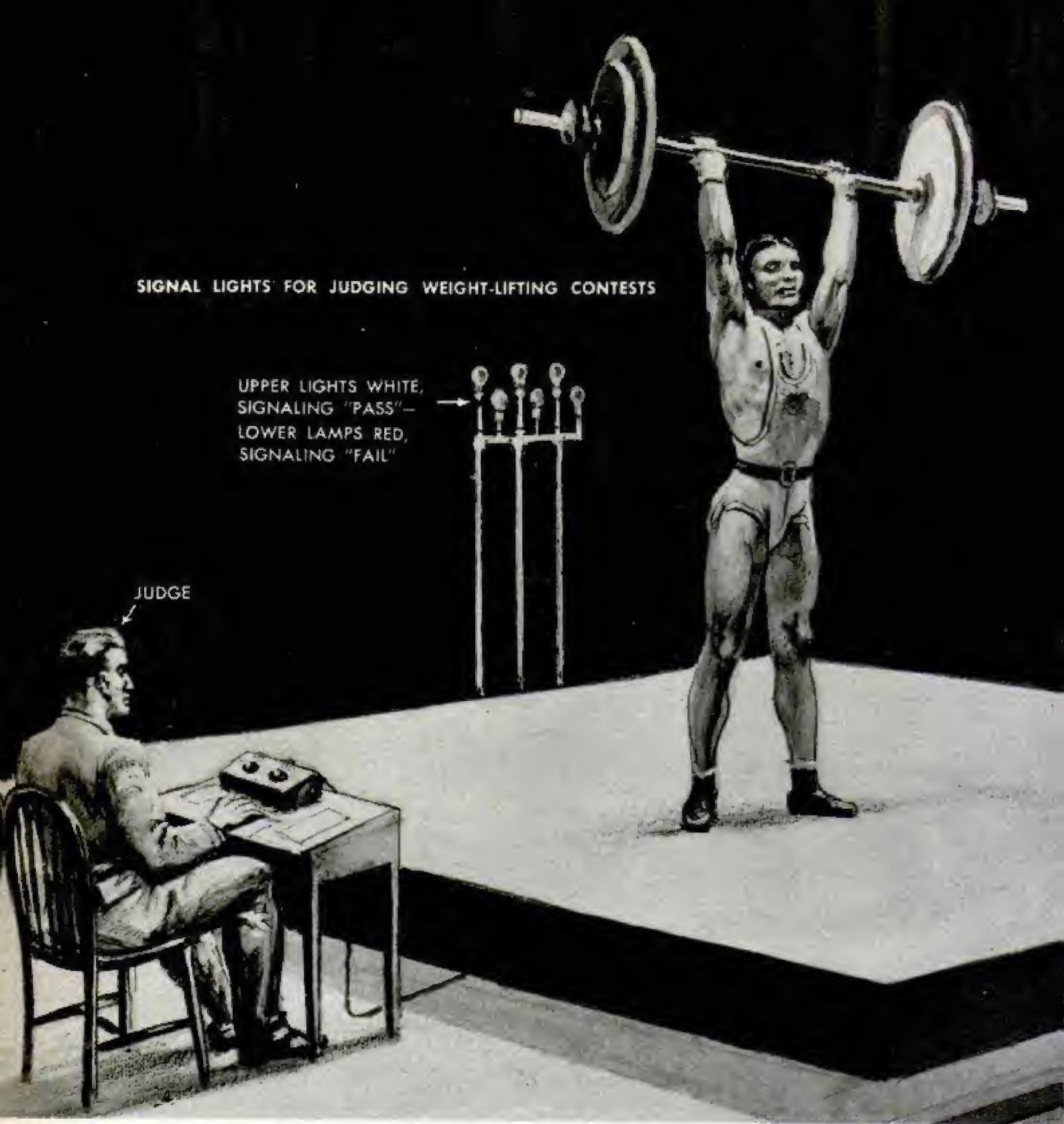
TEMPLE ISLAND

ON WORD "GO" OFFICIAL PASSES
BUTTON STARTING STOP WATCHES
IN JUDGE'S BOX

SIGNAL LIGHTS FOR JUDGING WEIGHT-LIFTING CONTESTS

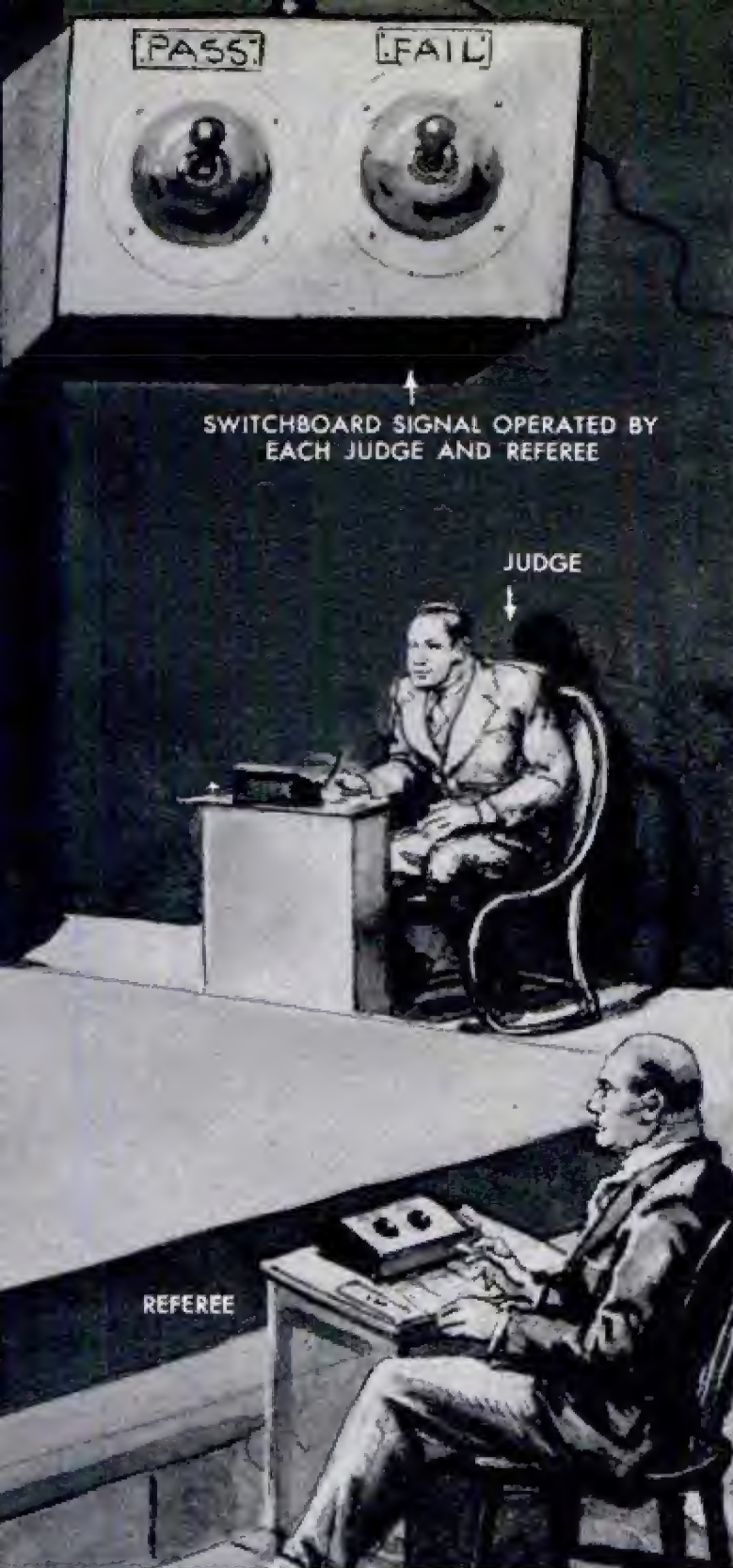
UPPER LIGHTS WHITE,
SIGNALING "PASS"—
LOWER LAMPS RED,
SIGNALING "FAIL"

JUDGE



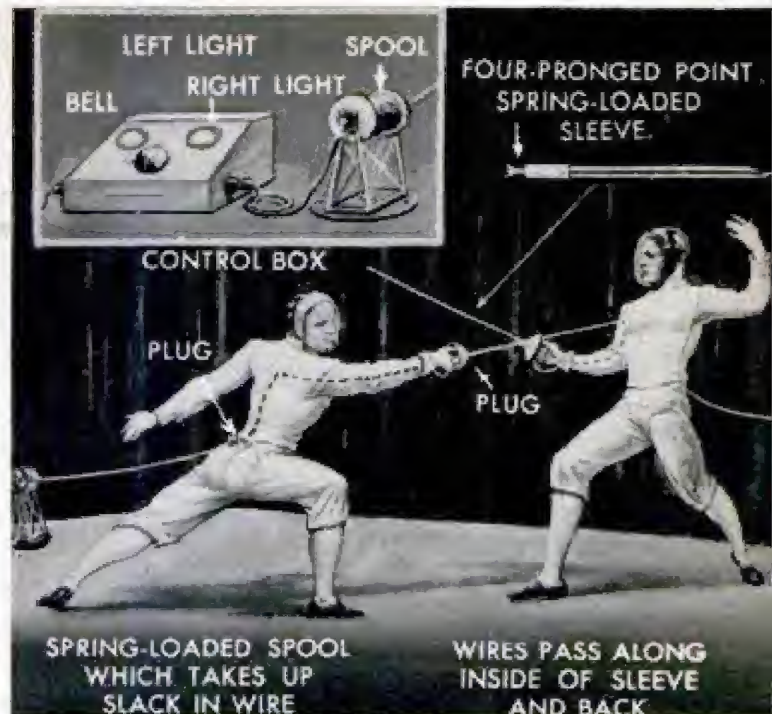
BROAD JUMP MEASURING AND SAND LEVELING GEAR





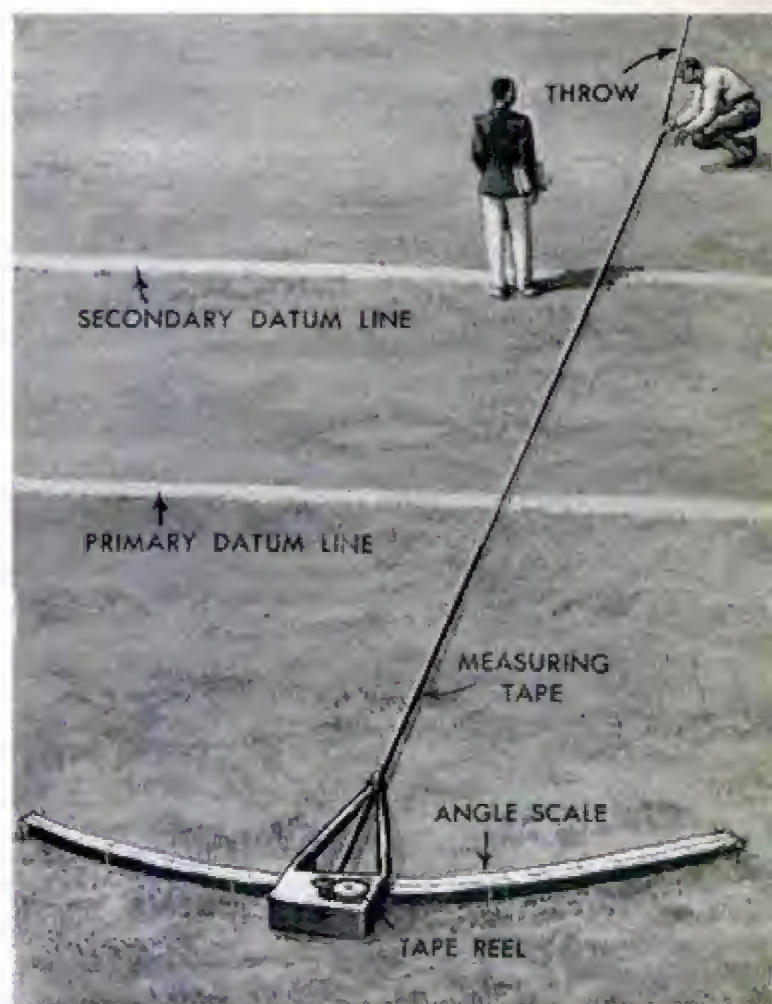
Above, judges' decisions in weight-lifting contests will be known instantly by the spectators. Using an electrical voting machine, each judge makes his vote visible when he throws a switch (see insert, top) at his table. The switches control two rows of electric lights behind the performer. The top row denotes passing votes, while the bottom row is for failing votes

Left, keeping the sand in the broad-jump pit level is important in the Olympics. A one-inch bulge reduces the distance jumped by two inches since the athlete's heels touch ground sooner. A special leveling device that runs on tracks (far left) will keep Olympic pits level to within one eighth of an inch. A triangular measuring device computes the jump distance accurately



Above, there's no doubt about touches with this electric scorer to be used in the epee fencing matches. A four-pronged point (top right) on the epee closes an electrical circuit when a touche is made. This moves the needle on one of the two dials in the control box (shown at the top left)

Below, long throws of the javelin and discus are measured quickly with a curved scale (foreground) staked down an exact distance from the throwing point. Length of toss is computed by measuring distance from end of toss to scale (see drawing) and then subtracting this from overall distance





CABLE TO STARTING GUN

STARTER PLACED SO THAT HE CAN WATCH STARTING POSITION OF EACH COMPETITOR

COIL SPRING CONNECTED TO TRIGGER LEVER

MAGNET

TELL-TALE LAMP

BATTERY

CABLE FROM STARTER'S PISTOL

STARTING LINE DRAWN TO ALLOW FOR DIFFERENCES IN DISTANCE TO BE COVERED

STARTER'S ASSISTANT

CABLE TO STARTING GUN

STARTING GUN APPROXIMATELY EQUIDISTANT FROM ALL COMPETITORS

Above, location of starting gun is important because of time required for sound to travel to runners' ears. Olympics' starters will use remote-controlled gun to give every runner an even start. Starting posts are staggered due to longer distances around outer lanes. Below, long a "must" at horse races, the photo-finish camera will be on duty at Olympic foot races

HOW PRINT SUBMITTED FOR JUDGES' INSPECTION CLEARLY SHOWS WINNER

WINNER

PUSH BUTTON TO START AND STOP RUN OF FILM

WIRE STRETCHED ACROSS PRINTING FRAME EXACTLY COINCIDES WITH FINISH TAPE. IT REPRODUCES ON PRINT AS WHITE LINE

BACK VIEW OF CAMERA, SHOWING CONTROLS

SHUTTER CONTROL

IRIS CONTROL

SPEED CONTROL BUTTONS (ADJUSTED ACCORDING TO SPEED OF RUNNERS)

RANGE FINDER

USED FILM DOOR

LENS

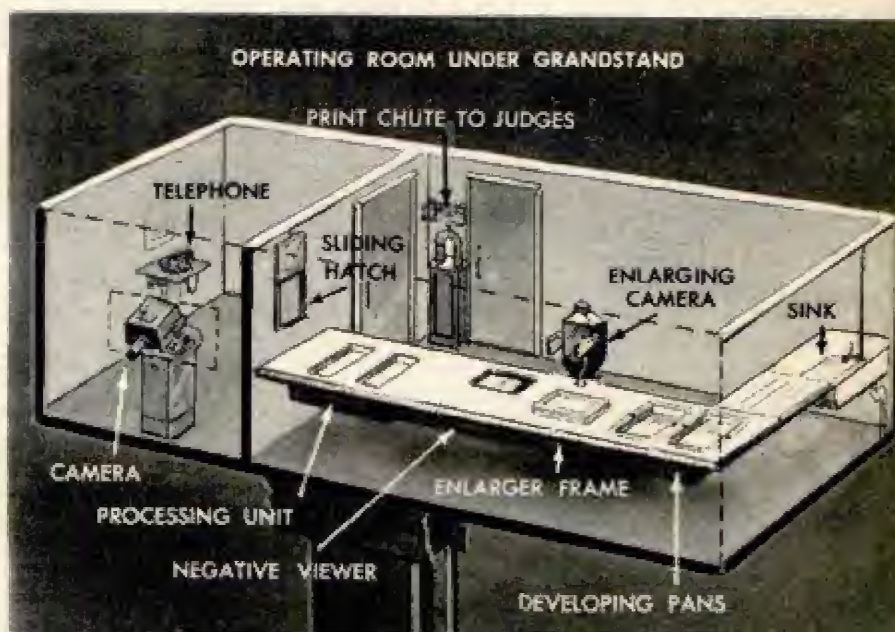
FRONT VIEW OF CAMERA

GENERAL VIEW OF OLYMPIC STADIUM GRANDSTAND IN LONDON, SHOWING POSITION OF CAMERA OPERATING ROOM



Above, photo-finish camera, mounted high on the grandstand, uses no shutter. Film rolls past a narrow slit inside the camera continuously at a speed relative to that of the runners. Drawing of the grandstand at Olympic Stadium in London also shows the areas reserved for judges and timers

Right, photographs of the finish showing the exact position of the runners can be delivered to the judges' stand in about 90 seconds. During this time, the film is developed and an enlargement made. Entire processing is done in this room adjacent to the camera room above the grandstand



IRON PACK HORSE



Called the "Motorized Jackass," a two-wheeled gasoline pack horse does the heavy hauling for hunters and workmen who carry heavy equipment. It carries up to 400 pounds over roughest country. Claws of spring steel on the front wheel make the "beast of burden" more agile than a mountain goat. It climbs telephone poles like a lineman (above). A 1½-horsepower air-cooled motor, controlled by a handle-bar throttle, develops speeds up to 300 feet a minute

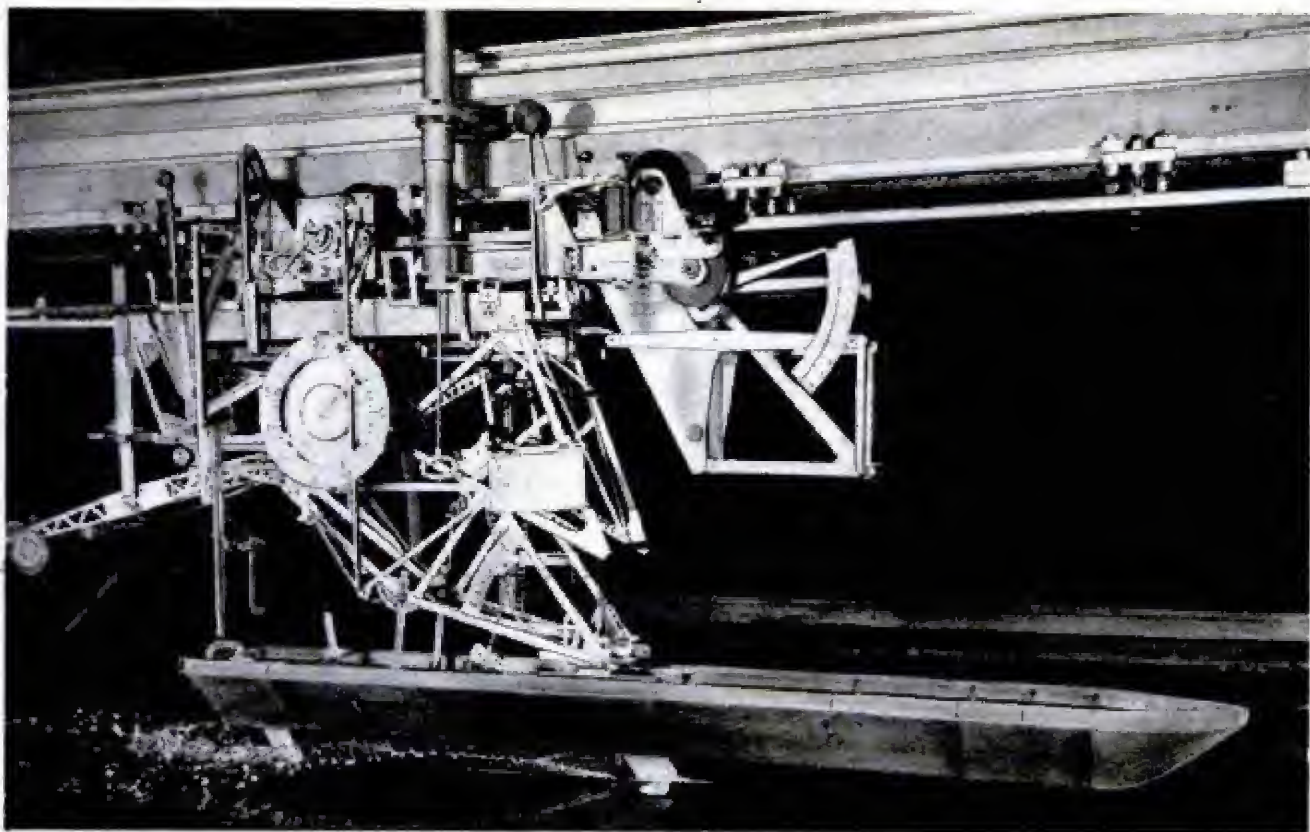


The right handle lowers to serve as a parking stand. Power is transmitted to the front wheel by a V-belt and chain drive. Throttle is on the left handle bar



Above, weighing only 125 pounds unloaded, it can be carried in the trunk of a car. Below, try this with a real, live horse. The mechanized burro is easily guided across a log bridge. Its rubber-tired rear wheel swivels to permit easy maneuvering

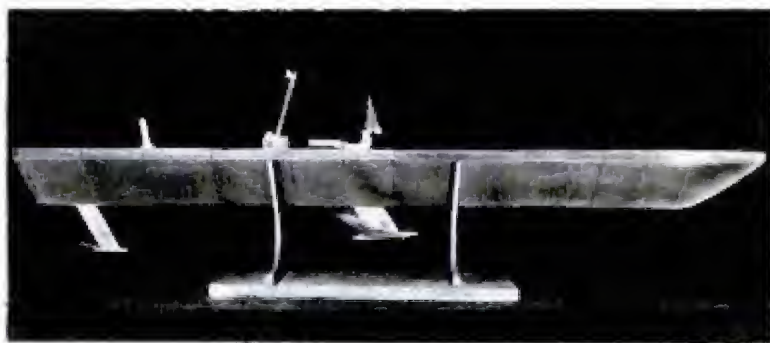




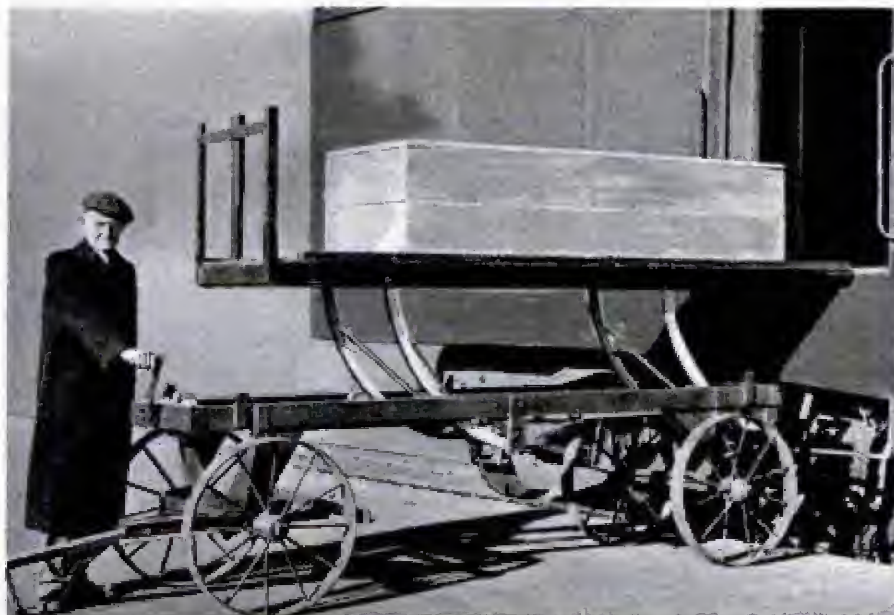
Boats Speed Over Water With V-Shaped "Wings"

Boats that "fly" a few inches above the water at high speeds may soon be built for the U. S. Navy. Two hydrofoils support the hulls, which float on the water only at low speeds or when stationary. These V-shaped fins support the boat above the surface and greatly reduce drag. Higher speeds than are possible with conventional hulls are expected with the same power. Tank models are undergoing tests to determine the best shape and location of the hydrofoils. At present, two are used—the main hydrofoil near the

† Complex instruments measure the lift of hydrofoils as hull model is tested in tank. Below, test model mounted on stand



center of the hull which carries most of the weight and a stern foil which adds stability. Research for the Navy is being conducted at Stevens Institute of Technology.



"Elevator" Trucks Load Baggage

Express shipments are loaded and unloaded by "elevator" when a new hand truck is used. Conventional express trucks are about 18 inches lower than the baggage car floor, requiring shipments to be lifted by hand. To make loading easier, Noah Swartz of Pueblo, Colo., has developed a truck with an elevating platform. Turning a crank rotates a screw gear to raise the platform.



Above left, steel panels interlock to form the exterior walls. Above right, mailbox and door chimes are installed at the plant and go up with the walls. Left, close-up shows layer of Fiberglas laid above ceiling as insulation

HOUSE of STEEL

Walls, ceiling and roof of a new prefabricated house are made of steel panels which interlock and are bolted in place. All the factory-cut parts can be fitted together on the site in two days. Layers of Fiberglas across the ceiling and aluminum foil in the walls provide insulation and soundproofing for the attractive four-room bungalow. The house is built on a concrete-slab foundation. Gypsum wallboard is nailed to furring strips to form the interior partitions. About 550 man-hours of on-the-job labor are required to complete the house, which has a total of 855 square feet of floor area.

← Steel window sash fits into frame of extruded aluminum
 ↓ Completed bungalow, erected in two days, has a large living room, two bedrooms, kitchen, service porch and bath





Plastic Newspaper Cuts Made in Four Minutes

Photos can be made into plastic one-column newspaper cuts in less than four minutes by a new photoelectric engraving machine. Its vital parts are an electric eye, a microscope, two cylinders and a red-hot stylus or needle that jabs a sheet of plastic 350 times a second. A positive photographic print, the same size as the cut desired, is attached to one cylinder and a sheet of plastic to the other. Flanking the latter is the engraving stylus. As the photo revolves on its cylinder the electric eye scans it, transforming light and dark values into impulses controlling the stylus.

When viewing light areas, the scanning unit signals for deeper cuts, removing larger amounts of the printing surface than it does when looking at dark areas. The operator uses the microscope to make adjustments corresponding to the tonal values of the picture. It produces a 65-line halftone, as large as 8 by 10 inches, which is mounted with adhesive on a metal base and locked into the page form. The cuts can be printed direct or matted. The machine was introduced by the Fairchild Camera and Instrument Corporation and is being tested by 26 newspapers.



Seaworthy Boat Hulls Molded of Plywood

Seven layers of wood $\frac{1}{8}$ inch thick are being molded into seaworthy hulls by a New England shipbuilder. Each successive glue-impregnated thickness is laid over a mold at a 45-degree angle to the previous

one, making calking and puttying of the seams unnecessary. The plywood's final bonding is done in a large cylinder by steam at 75 pounds pressure and over 300 degrees in temperature.

WILDERNESS UNSPOILED

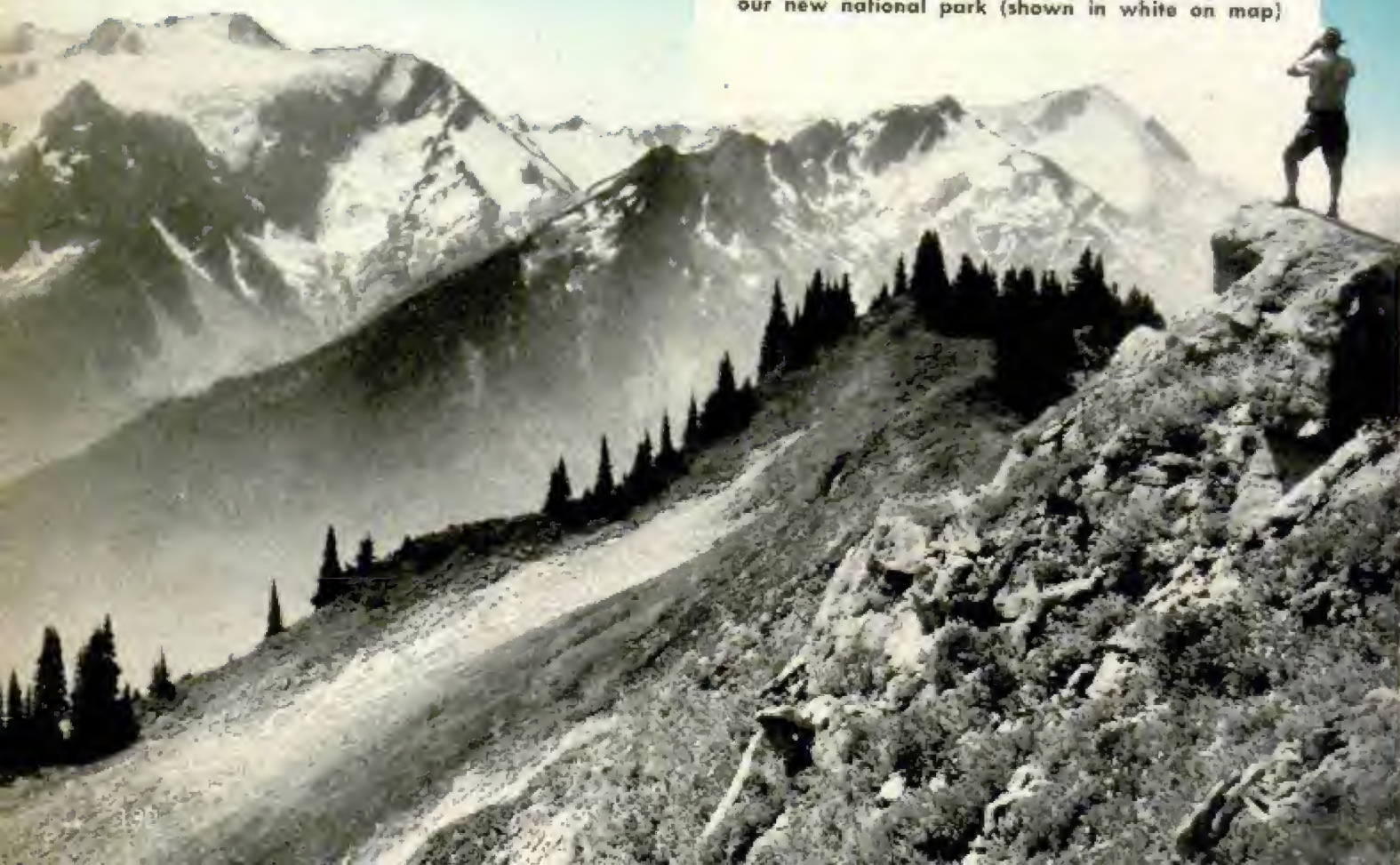


AMERICA'S "last frontier," the Olympic peninsula at the extreme north-west corner of the United States, is becoming one of the great scenic attractions of the West.

This year several hundred thousand visitors will travel through the newly dedicated Olympic National Park that occupies the heart of the peninsula. In preparation for them, Superintendent Preston P. Macy's construction crews are oiling the park's dirt roads, adding to the 570 miles of mountain trails that traverse the park, and building more shelters along the trails. Accommodations at the numerous resorts are being increased.

So large and rugged that the park rangers depend more on radiophone than they do on telephone for communication, the 848,000-acre preserve encloses the snow-capped Olympic Mountains that stretch up to lofty Mt. Olympus, 7954 feet in elevation. A dozen or more glaciers, two of which extend down to the 3400-foot level, blanket the slopes of the higher peaks. Also under the jurisdiction of the park service are many miles of wild sea-coast on the western side of the peninsula.

↓ Hiker studies Mt. Olympus, star attraction of our new national park (shown in white on map)





↑ Destruction Island with its lighthouse stands six miles off the coast of the rugged peninsula and is lashed by storms that sweep down from Aleutians

↓ Park ranger loops the antenna of his mobile radio around the roots of a weatherbeaten tree on the Pacific beach. There are 18 radio stations in the park

The park contains the most magnificent stand of timber that remains untouched in the country. It will serve future generations as an example of unspoiled native wilderness. Although much of the peninsula's timber has been cut, the lands that now make up the park were set aside as a national monument in 1909 before logging operations had moved into the area.

Included in the thousands of acres of fir, pine, cedar, hemlock and spruce in the park is the largest known Douglas fir, 17 feet 8 inches in diameter and more than 200 feet tall. A gigantic western red cedar 20 feet in diameter and a western hemlock 9 feet in diameter also have been found.

Bands of elk still roam the park's forests; deer and black bear are numerous, and coyotes and cougar occasionally are seen. Mink, otter and beaver also abound. The entire park is a wildlife sanctuary.

No roads cut through the park; instead, visitors have their choice of a dozen entrances from U. S. Highway 101 that loops around the park borders. From the south, two roads lead up past Lake Quinault to





Halfway up one of the mountains, two winter-sports fans pause a moment to enjoy the spectacular view

camp grounds and to resorts where meals, lodging and horses are available. On the east side, roads follow the Skokomish, Duckabush, and Dosewallips Rivers from the highway into the park, and on the north are spur roads that lead to Sol Duc and Olympic Hot Springs, Hurricane Ridge where skiing is a winter pastime, and to Deer Park, another winter-sports center. Roads from the west follow the Bogachiel, Hoh and Queets Rivers into the park. Many of the place names on the peninsula are native Indian words. Along most of the roads are public camp grounds equipped with water, picnic tables, rest rooms and sheltered kitchens. Headquarters of the park are at Port Angeles.

An incongruity of the peninsula is that one broad section receives an average of 12 feet of rain per year while less than 50 miles away the summer climate is so dry that crops must be irrigated. The heavy precipitation occurs on the western side of the Olympics and is caused by warm Pacific air masses coming in contact with the



Coastguardsman lowers tattered storm flags for replacement. Note driftwood deposited by other storms

Long arm of a derrick hoists supplies to the lonely lighthouse on Tatoosh Island near Cape Flattery





mountains. Winter is the rainy season. July and August are usually the driest months. The intense rainfall produces luxuriant "rain forests" of fast-growing trees and underbrush. Underfoot, the ground is carpeted with moss three to six inches deep.

Among the oddities found in the rain forests are long, straight rows of giant trees that apparently were planted that way. Centuries ago a number of seedlings took root on the trunk of some fallen tree. Rotting away through the years, the old trunk sustained the new trees until they got their roots into the ground to grow in a perfectly straight line.

The national park is only one of the attractions the peninsula offers. Along the ocean coast you may watch the Quillayute Indians or the Makahs still building their seagoing canoes by hollowing out giant cedar logs with an ax and hatchet. The 24-foot dugouts are stable and seaworthy craft that the Indians prefer over small boats fabricated of boards. Once the dugouts were used for sealing and whaling; now the Indians use them principally for salmon fishing.

At Port Angeles you may visit the Salmon Club on Ediz Hook and spend the day trolling for 50-pound Chinook

Above left, salmon boats tie up in the protection of a lagoon. Above, prize salmon is outlined on a plywood panel which will become a trophy like those in foreground. Below, highway winds along Lake Crescent shores



salmon in the Strait of Juan de Fuca. Salmon fishing is practically a year-around sport in the whole Puget Sound region. If you prefer fresh-water fishing you may try for native cutthroat or the rare Beardslee trout in the lakes and streams.

Tatoosh Island at the tip of Cape Flattery and the whole rugged coast are lashed each winter by storms that sweep down from the Aleutians. Shipwrecks have been fairly common in the past. In addition to numerous lighthouses and other aids to navigation, the Coast Guard maintains life-boat stations at Neah Bay and at Lapush. The Puget Sound itself is virtually an inland sea. The wooded islands, coves and headlands in the southern part and the many San Juan islands to the north make it a yachtsman's paradise.

The recorded history of the peninsula began in 1592 when a Greek pilot who used

the Spanish name of Juan de Fuca sailed north from Mexico in search of the fabled Straits of Anian that were thought to connect the Pacific and Atlantic Oceans. De Fuca found the strait that now bears his name although it was not until 197 years later an American pilot sailed up the coast to confirm the discovery.

Exploration parties from Mexico and the United States in the next few score years charted the waters of Puget Sound and mapped the principal mountains. Following the 1849 gold rush to the West Coast, fur trappers moved into the region.

Logging the vast forests of the peninsula became a big industry early in this century and continues to be a major industry today. There are hundreds of thousands of acres of timber outside the borders of the national park. Most of these were cut years ago but lumberjacks still find stands of the huge trees that originally covered the peninsula. These are cut and trucked to tide water where they are made up into rafts to be towed to the lumber mills. Second-growth timber now blankets many of the hills and mountains and provides the raw materials for the region's newsprint and pulp mills. Due to the mild climate and the heavy rainfall, reforestation of the forests proceeds automatically.

The small lumber and fishing towns of

← Indian applies a coat of paint to his dugout canoe

↓ Native in a 24-foot dugout puts out to sea. The canoes are built by hollowing out a giant cedar log



the peninsula are booming today although the area has had its share of depressions. According to a local story, money once was so scarce that only one \$20 bill existed in the town of Port Angeles. The bill was extremely useful, moving from hand to hand in payment of debts. One day it was discovered that the bill was a counterfeit. Everyone decided, however, that the note was a necessary part of the town's economy and so the butcher, grocer, teamsters and loggers continued to use it at face value.

Once residents of the peninsula had visions that it would become an industrial center. Great office buildings were erected on the site of Port Townsend and scores of pretentious mansions were built on the surrounding hills. Then industry settled in Seattle, Tacoma and the other mainland cities, by-passing the peninsula. By no means a ghost town today, Port Townsend remains as a quiet city of aged grandeur.

The peninsula is reached via modern highways from Olympia, the capital of Washington, or by crossing the sound on automobile ferryboats from Seattle. Its residents have always boasted of their tumbling streams and quiet lakes, their ever-green forests and snowy mountains. Occasionally they complain that photographs of the peninsula have been used to advertise the scenic attractions of California!



Rangers measure a giant cedar tree. One such tree has a diameter of 20 feet. Below, when houseboat stranded on a sand spit, it was converted to quarters for pilots of ocean ships





British Motorcycle Folds for Storage

Adapted from a collapsible model used by airborne troops, a small motorcycle being produced in England can be folded and stored in the corner of a room. The seat and handle bars lower for storage. It has a speed of 30 miles an hour and travels more than 100 miles on a gallon of gasoline. Throttle, clutch control and brake lever are mounted on the handle bars.

Rubber Mask and Throat Bag Give Hot and Cold Treatments

Hot and cold treatments are given with two rubber pain-relieving devices. One is a face mask that provides warming relief from sinus pains and the other is a wrap-around ice bag for treating sore throats.



Fountain Toothbrush

Holding several weeks' supply of liquid dentifrice in its hollow handle, a fountain toothbrush, shaped like a fountain pen, can be carried in the pocket ready for use at any time. The dentifrice is forced onto the bristles when a thumbscrew under the cap at the end of the handle is turned. A larger cap, equipped with a pocket clip, covers the bristles when the brush is carried in the pocket. The bristle end can be replaced when worn out.

Warm Air for Respirators

Air fed to men working outdoors in winter or in refrigerated rooms is warmed by a unit that clips to the rear of the user's belt. A thermostatically controlled heater and a heat exchanger are enclosed in a rubber cylinder 2½ inches wide and 11 inches long. The complete unit weighs only four pounds.





Stripped Landing Craft Becomes Car Ferry

Cars instead of tanks roll off a combat landing craft converted to a ferry. Three conventional boats were unable to handle the traffic across Florida's Tampa Bay, so the St. Petersburg Port Authority obtained the navy-surplus landing craft and rebuilt it into a ferry. The 205-foot boat was stripped of its stern bulkhead, landing ramp and much of the superstructure. Converted at a cost of \$75,000, the new ferry can carry 35 autos each trip along the 10-mile water route.

Sleek car ferry shown at top bears little resemblance to landing craft. Right, ramp was taken off to provide loading platform



Crusher Flattens Cans

Tin cans are smashed flat for salvage by a crusher operated by a long lever. The crusher, made of cast iron, is fastened to the top of any barrel or drum by a single screw. The can is placed between two plates and held by a riveted ridge. A notched arm falls into place under its own weight, and pressure on the lever crushes the can flat. Crushed cans require only one fifth as much space as ordinary cans.

Names and addresses of manufacturers of new products described in this issue may be obtained by writing to Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11

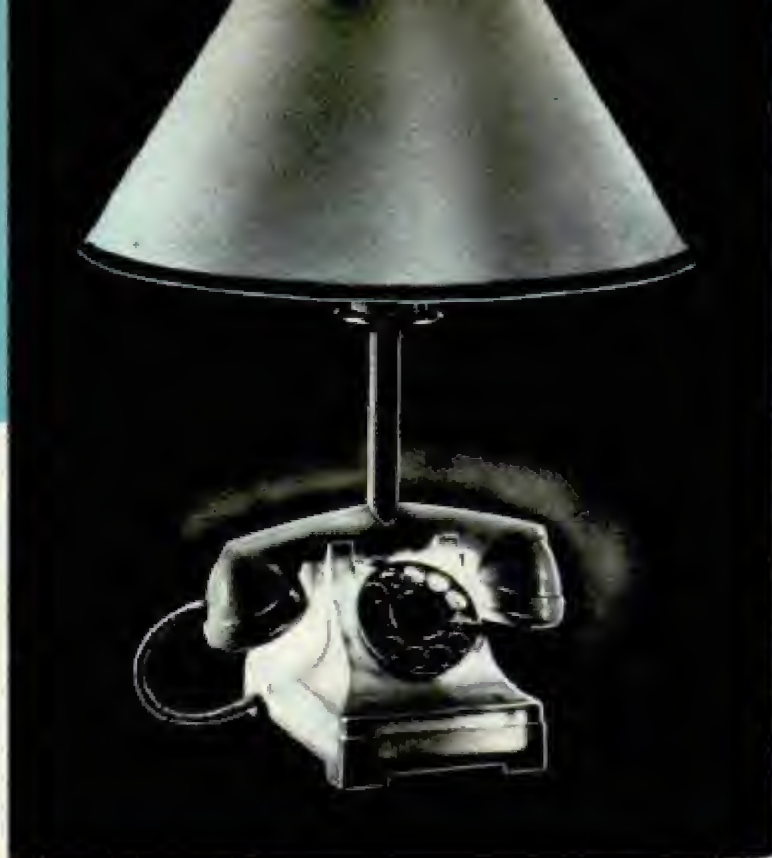
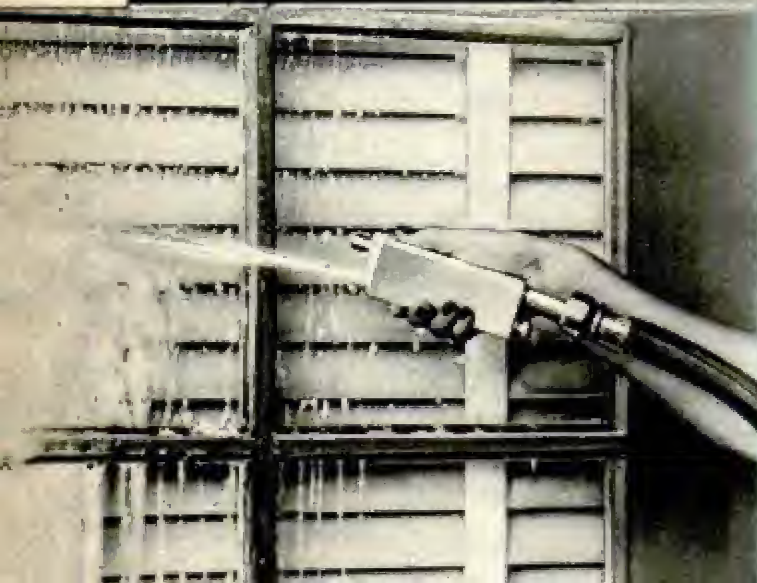
WHAT'S NEW For Your Home

Sources of supply for these products may be obtained from Bureau of Information, Popular Mechanics Magazine



CLOTHESLINE SAG is eliminated when an adjustable plastic connector is used to join the two ends

SUDS FROM NOZZLE convert garden hose into a pressure washer. Detergent stick fits inside nozzle

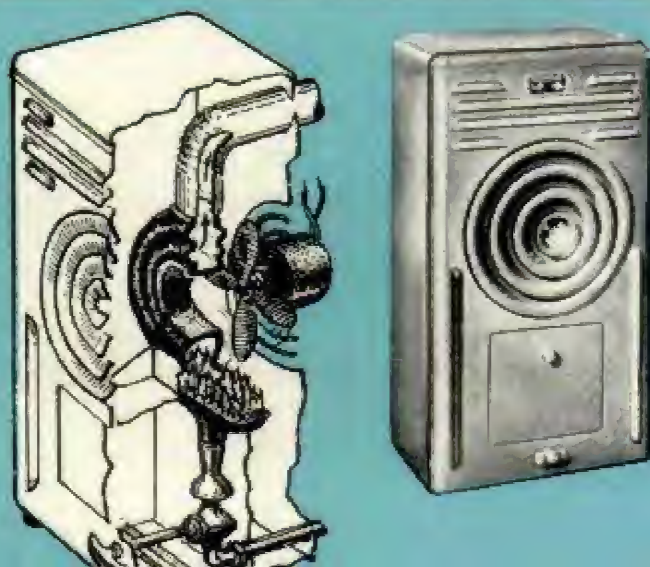


DUMMY TELEPHONE base of reading lamp lights up for use as night light. Dial serves as the switch



KITCHEN SLIDE RULE tells housewife the proper amounts to use when increasing or decreasing recipe

HEAT WITHOUT DRAFTS is what you get from this new space heater. Blast of fan, blowing through a concentric heat exchanger, is diffused by louvers



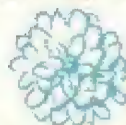


AIR CONDITIONER for homes has a movable Tenite grille to direct filtered air up, down or to either side. Unit is electrically operated

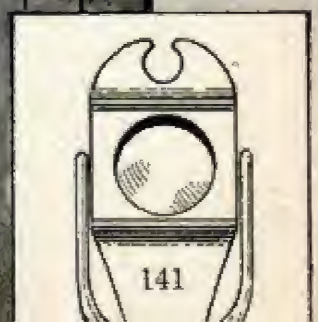
ONE-WAY-GLASS insert in door knocker lets you see the caller before you open the door. He can't see in. You can talk through it, too



WRIST ACTION is all you need to juice oranges on a hand-operated juicer. Pressure on the fruit spins burr in manner similar to system used in spiral screwdrivers



BURGLAR ALARM that winds like a clock protects door or window. When rubber-tipped arm is tripped, the alarm goes off



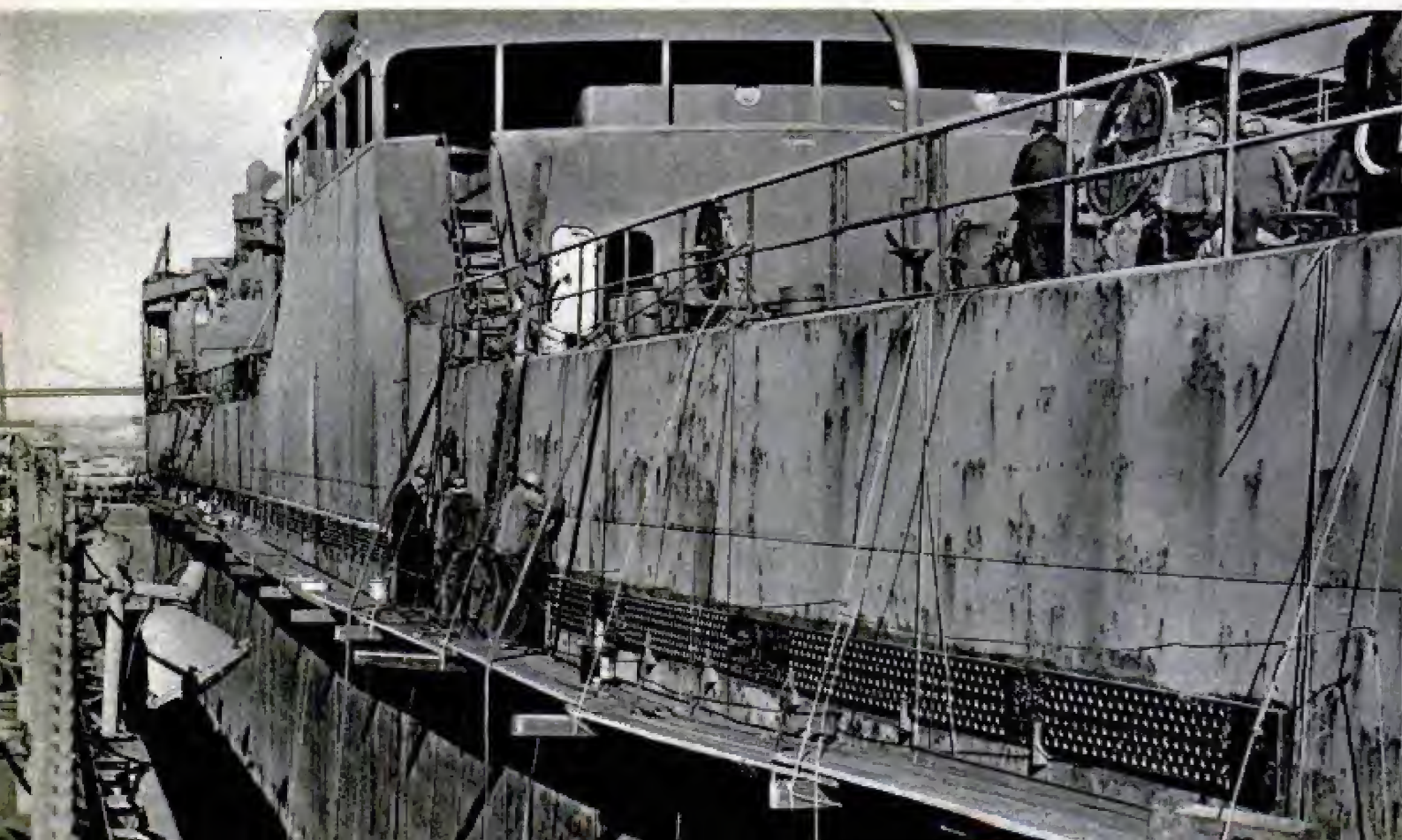


"Strapping" a Tanker

WELDING the seams of big tankers makes tighter and stronger joints, but it has one disadvantage—the seams don't "give" as do riveted joints. In rough seas, this characteristic sometimes results in cracking. Because the hull can't yield to the battering of waves, the ship splits open. A serious crack can split the ship in two. To prevent this, eight heavy steel straps were riveted over longitudinal slits cut in the tanker *Elk Basin* at the Bethlehem Steel Shipyard in San Francisco. The strapping operation won't eliminate cracking, but will arrest cracks so they won't split the ship wide open. When heavy seas open a crack, it travels across the hull until it runs into the crack arrester. There it is stopped by the longitudinal cut and riveted straps. Thus any crack can travel only one eighth of the way around the hull.



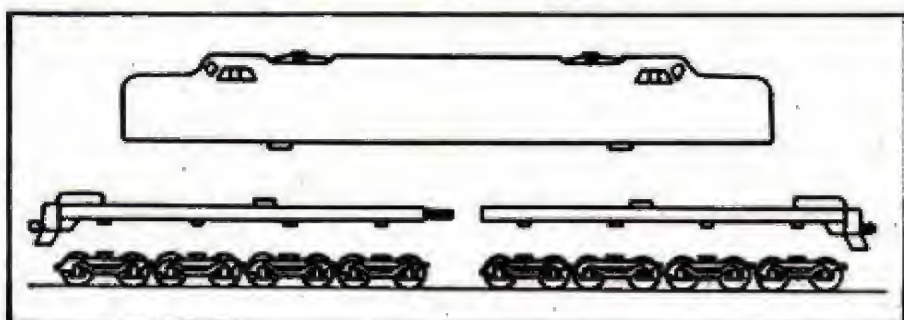
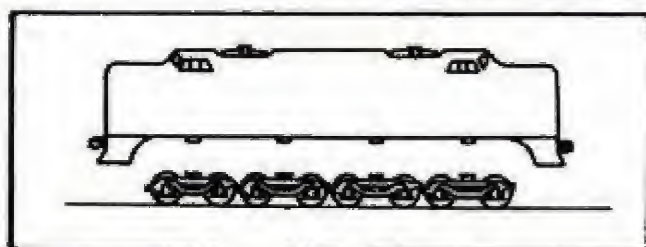
First step in the strapping operation is making eight precision flame cuts lengthwise in the hull (left). The perforated strap fits over each slit (below). Holes are drilled through the hull prior to the temporary bolting. The bolts are removed and rivets driven (top) making the straps permanent additions to the tanker's hull





Big or Little Electric Engines Made From "Packaged" Trucks

Electric locomotives with truck units that can be put together like building blocks to form small switch engines or powerful freight engines are being planned by Westinghouse. The basic parts, such as wheels, trucks and motors, are identical for all sizes, the only difference being in the number used and the body design. Each four-wheel truck has two electric motors of 469 horsepower each. Repairs and maintenance are possible with almost no interruption in service since individual trucks can be removed and replaced quickly. Another advantage, Westinghouse engineers state, is the broad distri-



bution of locomotive weight over many axles providing faster and smoother operation and better traction. By using eight trucks a locomotive can be built with 7500 continuous horsepower at the rails.

Precut Paper Letters Set by Hand as Type for Printing

Type proofs can be set by inexperienced personnel with a pad of precut letters, a composing stick and a roll of cellulose tape. The paper letters are die-cut to assure alignment and are available in 50 type styles and sizes. They are removed from the pad and inserted in the composing

stick, which has an adjustment for holding them at the proper tension. After the line has been set and spaced, the letters are covered with a piece of the tape and trimmed across the bottom and top. When the tape is removed the letters adhere to it and can be fastened in place on

the layout without additional adhesive. This method is useful in composing type lines for offset, zincs, silkscreen, blueprints or movie titles.



Flight-Time Recorder

When the propeller airstream reaches 40 miles an hour it begins to register hours and minutes on a new aircraft flight-time recorder. The unit's large, luminous sweep hand revolves hourly. Weighing less than a pound, the instrument is spring driven and has to be wound every 30 hours.



Flattop Dons Civvies as Speedy Freighter

Discharged from active duty as a baby flattop, the aircraft carrier Chaser has been converted to a speedy merchant ship and renamed the S. S. Aagtekerk. The ship is the third of 11 carriers being re-

modeled for freight service by the Gulf Shipbuilding Corp. Being completed at the rate of one a month, the freighters are 492 feet long and each has accommodations for 12 passengers in addition to crew.



Copyright Howard M. Edmunds

Chart Adds Fractions

Fractions are added or subtracted at a glance on a printed chart of fraction combinations. There are no moving parts and no written or mental computation is necessary. The fractions to be added are selected on two edges of the chart and the lines from these fractions are followed to their intersection. From this point a diagonal line leads directly to the answer. For subtraction, the procedure is reversed.

❏ A lightweight fiber concrete, several times more resistant to damage by fire than normal sand-cement concrete, has been developed at the University of Michigan.



Can we save our trees?

↓ Of 35,000 seedlings exposed to disease, this elm is only one that survived. It may become granddaddy of new strain to replace elms like one above

USDA photos



By Clifford B. Hicks

TREES with naked limbs and rotting trunks are no strange sight in Columbus, Ohio. The city pays out more than a million dollars a year to haul away elm trees that have been attacked by a deadly disease called phloem necrosis. It's an epidemic that stalks up one street and down another, threatening every elm in Columbus—and every elm in the country.

Yet the elm tree, under attack by both phloem necrosis and the dreaded Dutch elm disease, is only one of our many shade, forest and fruit trees threatened by powerful organisms that could bring extinction. Across the United States only a few scattered American chestnuts remain—most have been wiped out by a fungus. White pines from Maine to Minnesota and southward to Virginia are dying at an alarming rate. The giant cactus of Arizona and the West-Coast orange trees are under attack.

Why are diseases cutting down our green giants at such an alarming rate? Many new diseases that roam the country are speeded on their deadly job by the modern system of planting many trees of the same species in the same area.

There are grave doubts that some species can be saved from extinction. Yet some of



USDA photos

Bagging flowers on Asiatic chestnut prevents them from pollinating, one step in breeding new strain. Below, dead stand of chestnut shows why new strain is necessary. Disease has killed almost every American chestnut



the diseases have been stopped cold and others may yield soon to the wizardry of scientists of the Department of Agriculture's Division of Forest Pathology. These men are not tree doctors, but research specialists who toil to discover what bit of living death lashes out at our trees. In the division's headquarters at Beltsville, Md., and the 15 field stations scattered across the country they probe the private lives of all kinds of trees suspected of being sick.

Results of this research are distributed through literature and through disease-resistant tree specimens. The scientists make no claim that they can eradicate a disease completely—you can't quarantine every elm tree in the country. Their work is aimed at establishing enough control to prevent serious loss.

Not only virus and fungus-type diseases, but greedy insects cause untold damage yearly. For example, a spruce beetle has destroyed more than four billion board feet of timber since 1940. But the battle against insects is waged by another division, Forest Insect Investigations. The Division of Forest Pathology is concerned only with diseases.

Because trees can't talk and don't mature as fast as humans, diagnosis is a tough problem and treatments may take many years to work out. Dr. Lee M. Hutchins, director of the division, points to some of the work which he terms "hundred-year projects."

Take the case of the Dutch elm disease. This disease, carried by bark beetles, has been rampaging across the country since 1930, killing thousands of our most beautiful shade trees. Ef-

forts to wipe out the disease have failed, so the USDA scientists have turned their magic toward developing a new type of elm that is resistant to this disease and phloem necrosis.

Of 35,000 seedlings that originally showed promise of resistance, only one has withstood three consecutive seasons of heavy inoculations. Yet the scientists are not disappointed, for this lone seedling may become one of the parents of a hybrid strain that can fight off both diseases.

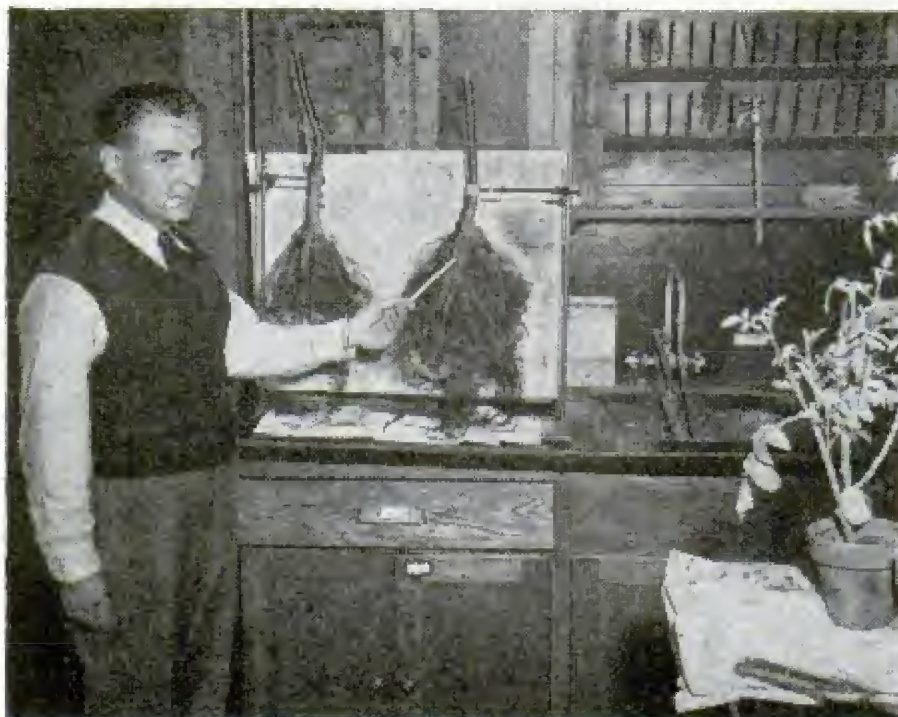
The division casts a watchful eye on diseases that are on the rampage halfway around the world, for such diseases easily could slip into this country. Once such a disease gets a foothold it may spread across the continent. About 50 years ago some unknown nursery imported an Oriental chestnut for breeding. That chestnut was infected with a fungus. Today practically every chestnut in the natural range of this tree has been killed. Now scientists are attempting to breed a new type of chestnut that will resist the disease. Their efforts show such promise that pollen from



From their perch atop a mobile power sprayer, workers send a mist of death down on the codling moths infesting a big walnut grove

Infected seedlings from a nursery could spread a disease across the entire country. Here pine seedlings are sprayed as protection from rust





Dr. Pierre Miller, UCLA scientist, points to gall on roots of a peach tree caused by worms. He kills worms with hot water

mined definitely that they are free of disease.

Among the most popular shade trees in eastern seaboard cities is a species of sycamore called the London planetree. An estimated \$1,500,000 has been spent in planting these trees to beautify our cities. Yet within the past few years a deadly fungus has been racing down the city streets killing many of them.

The first step of the USDA scientists in battling a disease is to find out how it is carried. In

some of the hybrids was flown a few months ago to scientists in Italy, where the same disease now is raging.

Since the turn of the century more than a dozen new diseases have slipped into the country on imported seedlings or lumber. In recent years strict quarantine laws have kept plants off our shores until it is deter-

the case of the planetree they have discovered that the disease cannot readily move by itself but is spread mechanically by such instruments as infected pruning tools. It has been demonstrated that a wandering boy who jabs his pocketknife into a diseased tree and then sticks it into other trunks can infect every planetree in his

By selection and treatment of seedlings in western nurseries, new diseases can be stopped in their tracks





Tree surgeon of Los Angeles administers shots of iron citrate to eucalyptus tree to cure an iron deficiency

path. Others have been fatally inoculated when a youth carved his girl's initials in their bark. Through recent efforts of the USDA and complete cooperation of the cities, many of the planetrees have been saved. Linemen and tree surgeons should use only sterilized equipment when working on the London planetree. This disease so far has been confined to the eastern states and Mississippi.

Farther west in Arizona, the saguaro or giant tree cactus is being felled by a tiny bacterium that causes a soft rot in the trunk and huge arms. Scientists fear that the finest stands of this towering symbol of the Southwest may be ruined within a few decades. This strange disease, thought to be carried by a night-flying moth, is killing cacti by the hun-

dreds. Mature saguaros more than 100 years old are the chief victims. No way has been found to prevent the disease from eating the heart out of these old-timers. And few young cacti are springing up. Saguaro seeds are sought by birds and rodents, and only a few survive the rigors of the desert. Those seeds that live and germinate do so

(Continued to page 240)

USDA photo



Elm disease has killed the trees on one side of this street and now is starting down other side



Coin-Operated Shoe Polisher Shines Two Shoes a Minute

Coin-operated, a shoeshine machine puts a polish on both shoes in one minute for a dime. The machines are labeled according to the color of polish used. A timing device shows the customer when it's time to change from one shoe to the other.



Hose Sprayer Mixes Insecticide

Attached to the garden hose, a lawn sprayer automatically mixes an insect-killing solution of any desired strength and sprays it in a fine mist or a steady stream. The full-strength solution is poured into a glass container to which the hose is attached. Water pressure through the hose forces the solution up a tube and into the water stream. A dial on top of the container regulates the strength of the mixture. The sprayer also can be used to disinfect poultry houses, barns and other farm buildings, and to spray livestock.

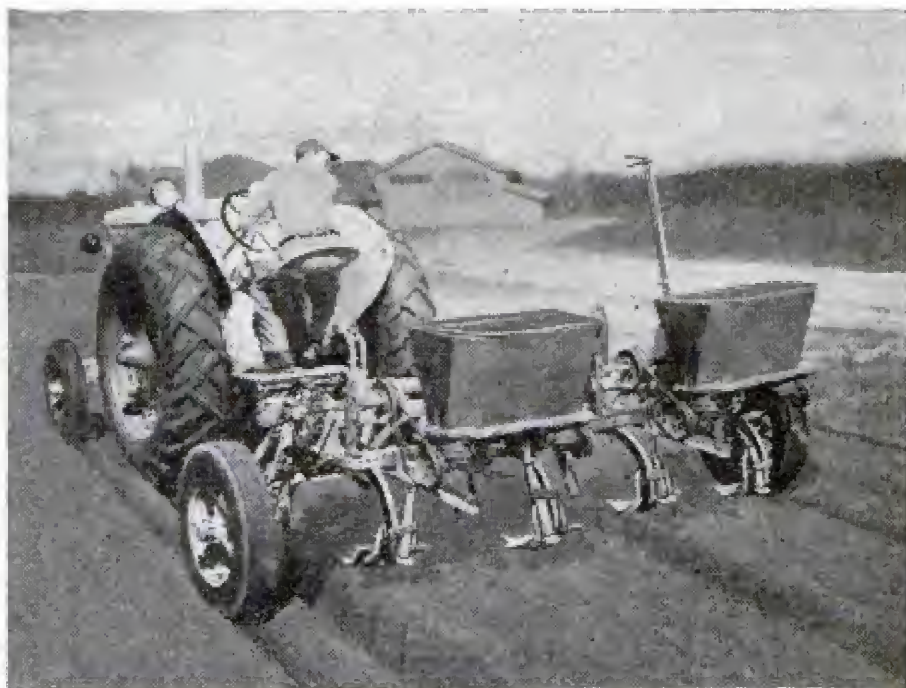
Motor-Driven Sweeper Cleans an Acre an Hour

Driven like an automobile, a high-speed vacuum sweeper picks up dust and litter at a rate of 44,000 square feet an hour. Powered by a six-horsepower gasoline engine, the sweeper has a combination revolving brush and vacuum-fan cleaning system. The sweeper compartment is 36 inches wide and is "sealed" to the floor by a flexible rubber skirt. Material that is picked up is collected in a removable hopper. Light dust is collected in a fabric bag. The cleaner travels up to six miles an hour.

Scientists report that the most abundant chemical elements are hydrogen and helium, followed in order by oxygen, nitrogen, carbon and neon.

Fertilizer Spreader Uses Tiller Frame

By combining parts of a duckfoot tiller and a potato planter, South Dakota farmers made a subsurface fertilizer spreader for use in soil-conservation tests. The fertilizer attachment from the potato planter was mounted on the tiller frame and the shovels of the duckfoot cut down and rearranged so fertilizer can be deposited between corn rows. Four tubes from the two boxes direct the fertilizer behind the shovels.



Lens Quadruples Air Camera's Scope

Almost four times the area photographed by orthodox aerial cameras is embraced by a new wide-angle lens revealed by the National Bureau of Standards. It gives the region covered by the lens the curved appearance of a giant golf ball. Effective exposure is at its maximum at the center and decreases rapidly towards the edges of the target area. The new lens is expected to be of great value in future mapping operations. It was tested at 10,000 feet over Dayton, Ohio, site of the Air Force's principal aerial photography experimentation center.

Four-Lens Turret for Cine Special

Users of the Cine Special with its two-lens turret can now use any combination of four lenses with a special custom-made turret. There is no interference in the fields of view even when using the wide-angle lens and six-inch lens on the same camera. No changes are made in the camera during conversion and the original turret can be replaced at any time.

¶The new passenger liner Lurline, sailing between Honolulu and San Francisco, has two giant evaporators capable of supplying 80,000 gallons of fresh water per day.





Transparent Diving Helmet Permits All-Around Vision

There are no blind spots in a plastic diving helmet designed by a marine photographer in Rochester, N. Y. Air is pumped into the helmet through the hose connection above the left ear. Heavy weights press the helmet down against the shoulders and chest and air pressure inside the helmet holds back the water.



"Lipstick" Flashlight to Fit Purse Uses Special Midget Battery

Convenient to carry in the purse or pocket is a tiny flashlight about the size of a lipstick case. Only $\frac{1}{2}$ inch in diameter and two inches long, the flashlight uses a special small-size battery. The light is available in sterling silver, solid gold and jeweler's metal. Chains, key rings and name tags may be attached to the flashlight.



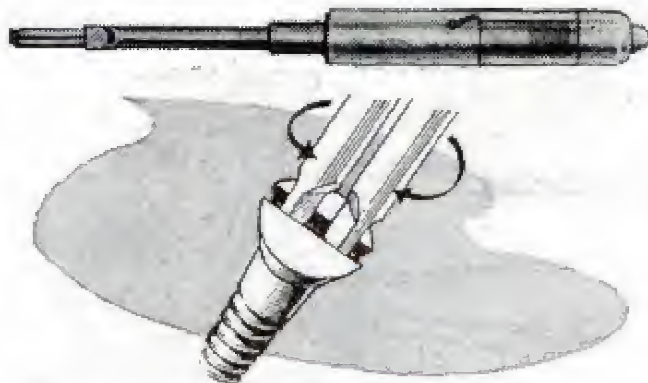
Typesetting Is Simplified By Small Color Press

Color printing on any material from tissue paper to metal six inches thick can be done with a new British printing press that is little larger than a typewriter. Colors are printed with rolls of colored foil that feed into the press automatically. Typesetting is simplified. Pieces of type are set on the platen in normal reading order. The letters are etched on the back of the type and the operator spells out the words from left to right or merely places the type over



Left, type is placed upside down on a layout sheet. An adhesive transfers it to top platen. Right, the operator removes a color-printed poster from press

the artist's layout. When the type is set, a sheet of adhesive paper is placed over it and the platen slid into the machine. A combination of heat and pressure transfers the type to the top platen, leaving the printing surfaces of the type in position for the impression. Because of its simplified operation, the press makes possible economical printing of one or two copies of each run. When used with an etching process, it also prints color on metal.



Starting Tool Locks in Screw

Screws can be started in confined places by a tool that locks in the slot of the screw while acting as a screwdriver. The head of the tool has two small blades which rotate in opposite directions when pressure is applied to the handle. This action locks the blades in the slot. A release mechanism in the handle permits the blades to be disengaged. The handle of the screw-starter is made of nonconducting plastic.

Pocket Kit for Fishermen Has Transparent Case

Fishermen can carry hook, line and sinker in their hip pocket safely when a kit that includes a Tenite-plastic carrying case is used. Its two transparent tubes are joined by a flat section of the same material. In the kit are 30 feet of line which wraps around the middle section and two snelled hooks, leader, split shot, clincher sinker and a cork float with a screw eye, all carried in the tubes. The handy case is not affected by salt water.

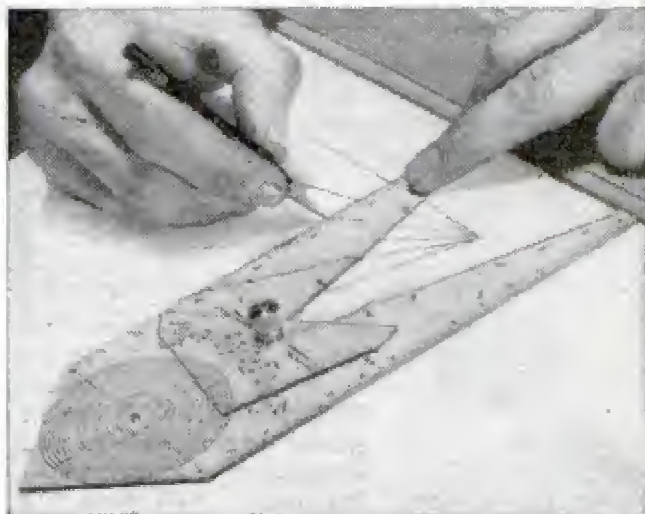


Sun Visor Protects Yachtsmen From Direct and Reflected Rays

Consisting of two Polaroid filters, a sun visor for boats holds back the harsh glare of sunlight reflected by the water, but permits useful light to pass through. The smaller visor filters direct glare when the sun is low in the sky, while the larger filter protects the yachtsman from reflected glare. When the sun is high in the sky, the larger filter is used alone.

Combination Drafting Tool Has Wide Variety of Uses

Eliminating the need for several triangles, a new drafting tool draws all the basic 15-degree angles. In addition, it locates center points for radii and divides angular lines in the center. A float on top of the tool is used with its protractor scale to provide any angle and its 90-degree complement. A full 7-inch scale and a 14-inch half scale are provided on the outside edges of the tool.





LEG POWER spins the propeller of this motorless boat by pedal action. Being silent, it's ideal for trolling

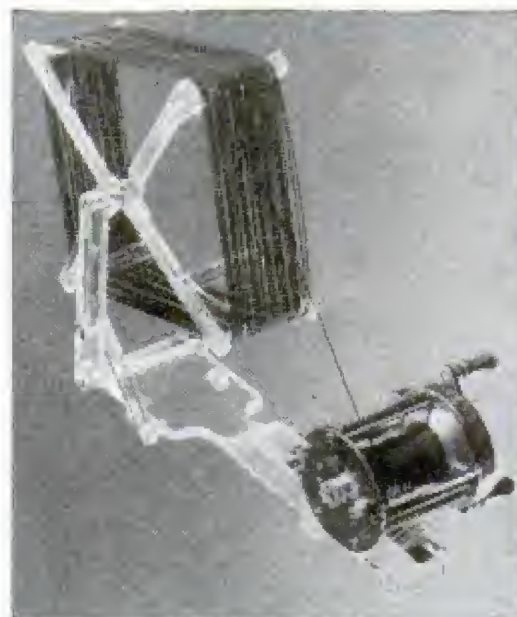
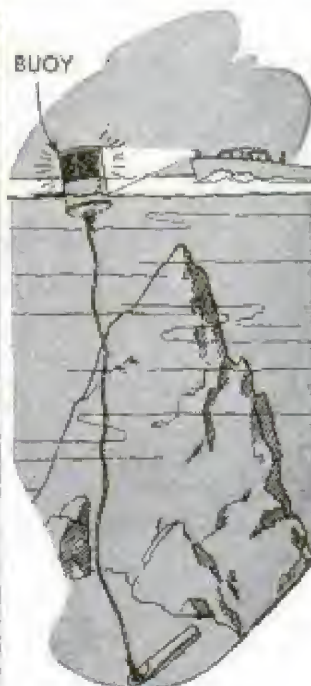


BILGE PUMP is also powered by foot. Its pumping rate is about $3\frac{1}{2}$ gallons of water per minute

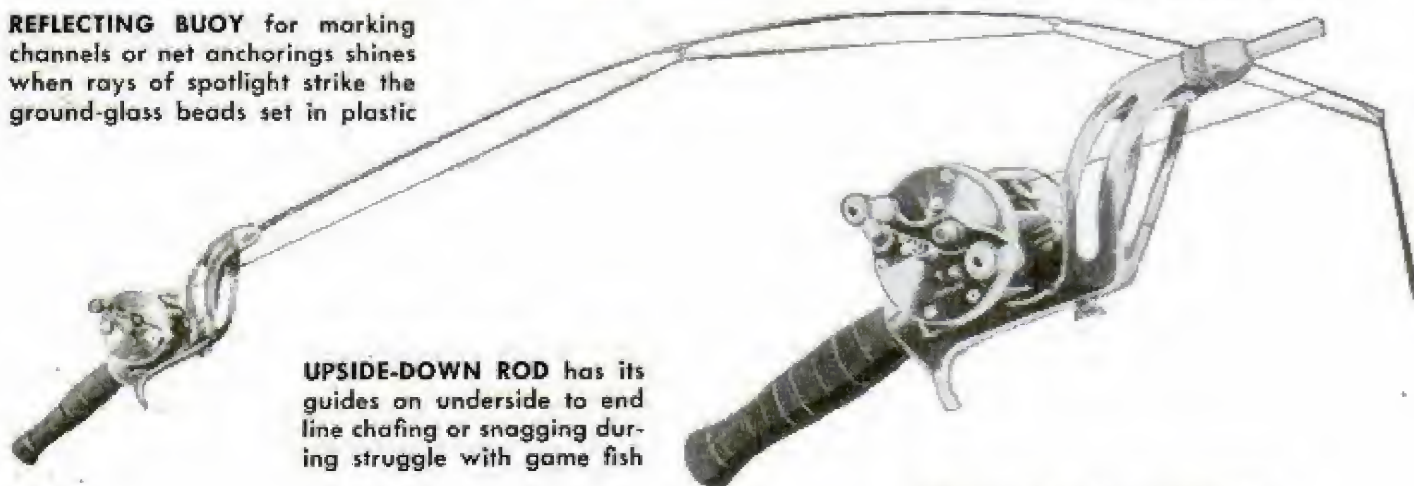
fisherman's page



REFLECTING BUOY for marking channels or net anchorings shines when rays of spotlight strike the ground-glass beads set in plastic



LINE DRIER has a built-in reel holder. When folded, it fits into the coat pocket



UPSIDE-DOWN ROD has its guides on underside to end line chafing or snagging during struggle with game fish



High School Students Drive "Cars" in Classroom

Model automobile steering wheels that look like the real thing are aiding a high school instructor at Bloomington, Ind., in teaching students to drive. Each seat in the classroom is constructed like a driver's seat complete with steering wheel, brake, clutch, accelerator and gearshift. Wires

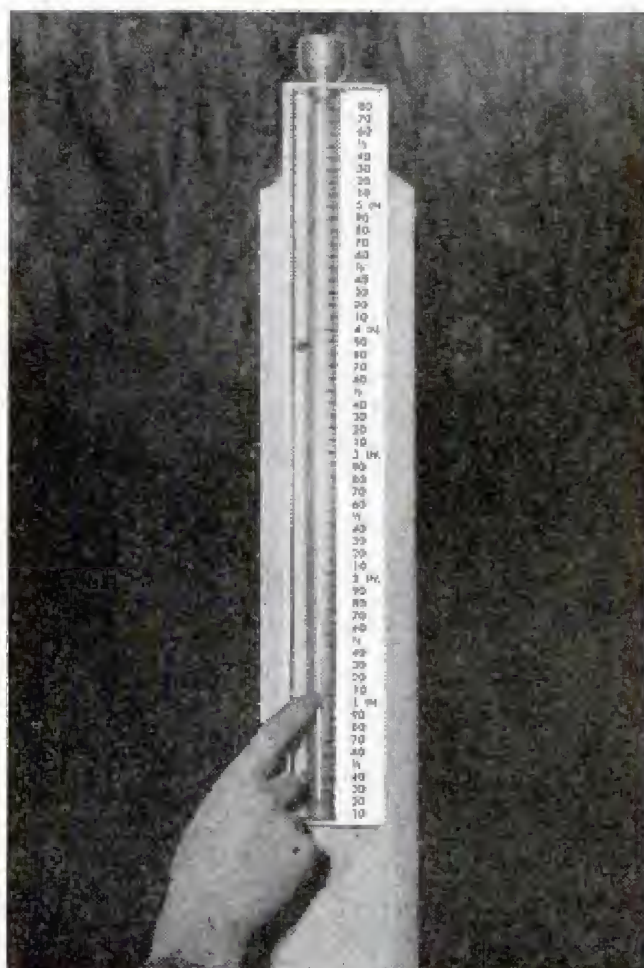
connect the seats with an electric panel in front of the instructor. As he describes traffic situations, the students "drive" along to solve the problems. The electric panel gives the instructor a check on each student's reaction. The models were built by boys in the school.

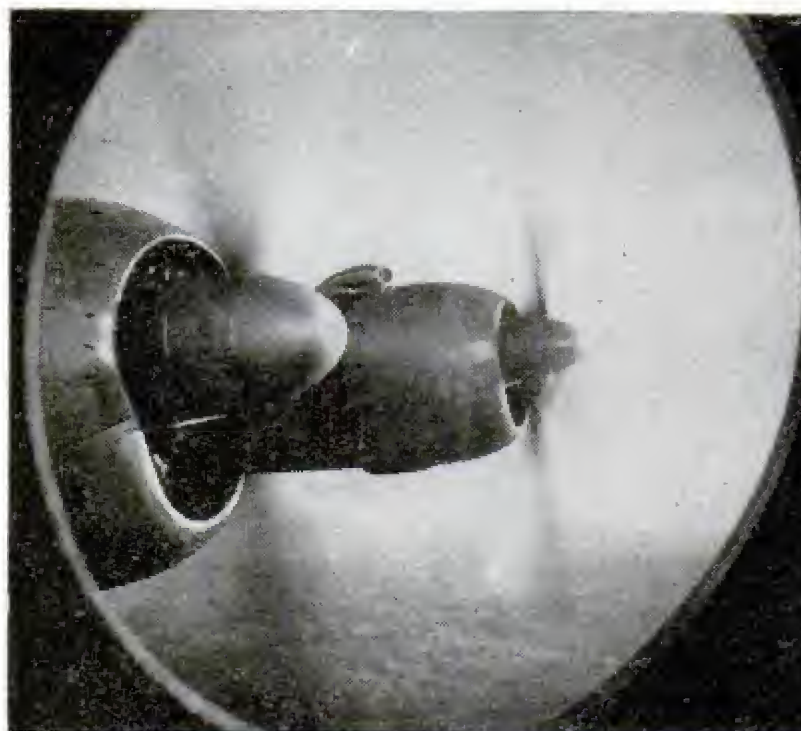
Rainfall Gauge for Home Use Reads Like a Thermometer

Rainfall is measured in inches by a gauge that can be read like a thermometer. The gauge, consisting of a scale, rain catcher and plastic tube, is mounted in the yard as far as possible from high objects. Rain falls into the funnel-like catcher and collects in the tube. The reading then is taken from the scale along the side of the tube. The gauge is designed on a ratio of four to one—one inch of rainfall measures four inches in the tube, but is read directly from the scale as one inch. A record book with the gauge provides space for recording the rainfall for 11 years.

Brake Lock Holds Car on Grade

Operating only when the clutch pedal is depressed, a brake lock prohibits cars from rolling backward or forward even though the brake pedal is not held down. The lock leaves the driver's right foot free to rest on the accelerator for smooth starts. Depressing the clutch prepares the lock for operation, but the brake pedal must be depressed once before the lock actually becomes effective. When the clutch pedal is released, the lock immediately disengages so that it cannot interfere with normal operation.





Portrait of the "Constitution"

A four-page album of pictures of the U. S. Navy's double-deck flying transport, the 180-passenger Lockheed "Constitution"

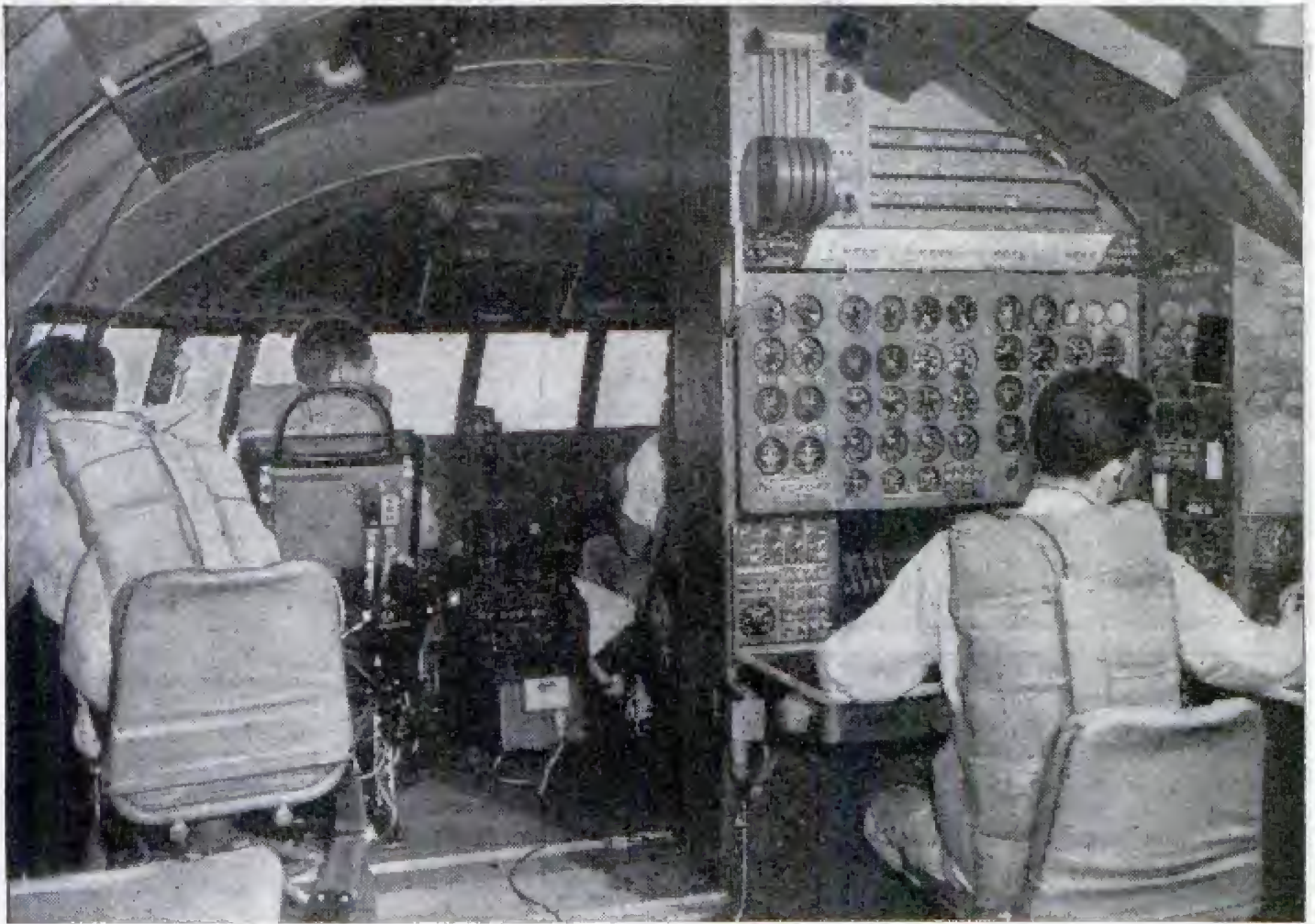
Lockheed Aircraft photos

THE NEW air queen of the Navy is the most easily controlled plane I've ever flown," said Lockheed's chief test pilot when he stepped out of the 92-ton "Constitution." Despite its great weight, the plane can get off the ground in 27 seconds from 1820 feet of runway! At a top speed of 300 miles an hour it is about 20 times faster than its namesake, the most famous warship in U. S. Navy annals, generally referred to as "Old Ironsides." With a double-deck fuselage 189 feet long and wings spanning 156 feet, it seats 180. In an emer-

gency 400 can be accommodated. A specially designed four-wheel truck-type landing gear on each side distributes the weight sufficiently to allow use of most large airfields. The multiple wheels also reduce the effect of tire blowouts to a minimum, permitting landings under favorable conditions with any two tires deflated on a single main landing gear. Four 3500-horsepower Pratt and Whitney Wasp Major engines have replaced the original 3000-horsepower engines. It was designed to use gas-turbine engines when they are available.

Passengers can be carried on two decks. The wing design anticipates later installation of gas turbines





Flight engineer, right, handles all engine controls, except on take-off and landing. Another man runs electrical controls

Right, 30 of huge ship's 180 riders sit in upper deck area beneath the 50-foot-high tail



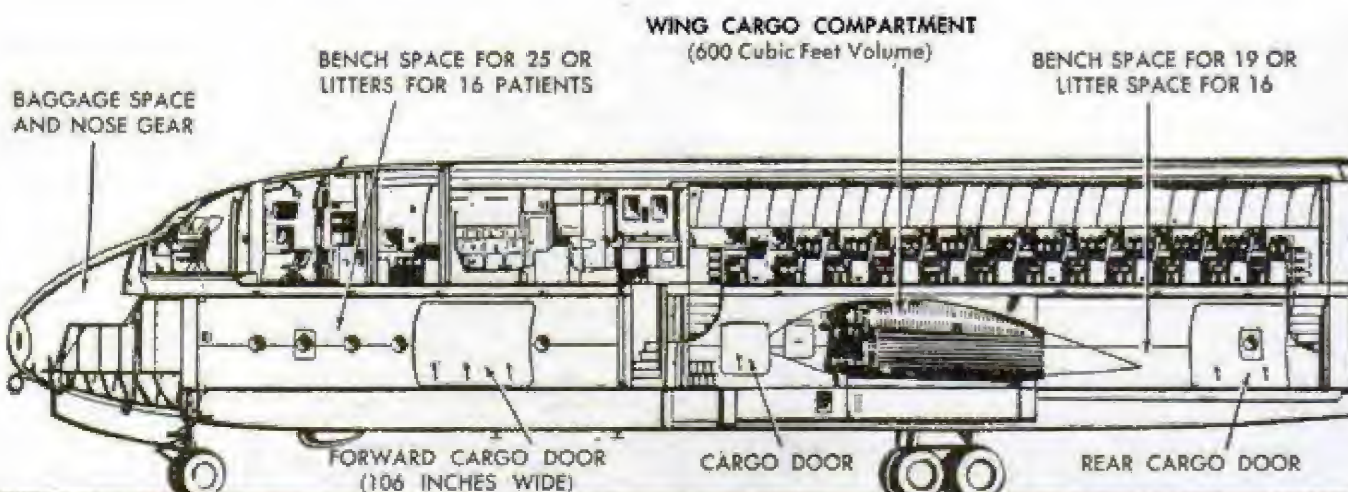


Above left, cameras recorded every response on instrument panel during plane's year of flight tests, when it logged over 20,000 miles

Above right, wings are so large that mechanics can walk or crawl inside them to get at all four engines for maintenance chores during flight. Tunnel doors open into the fuselage

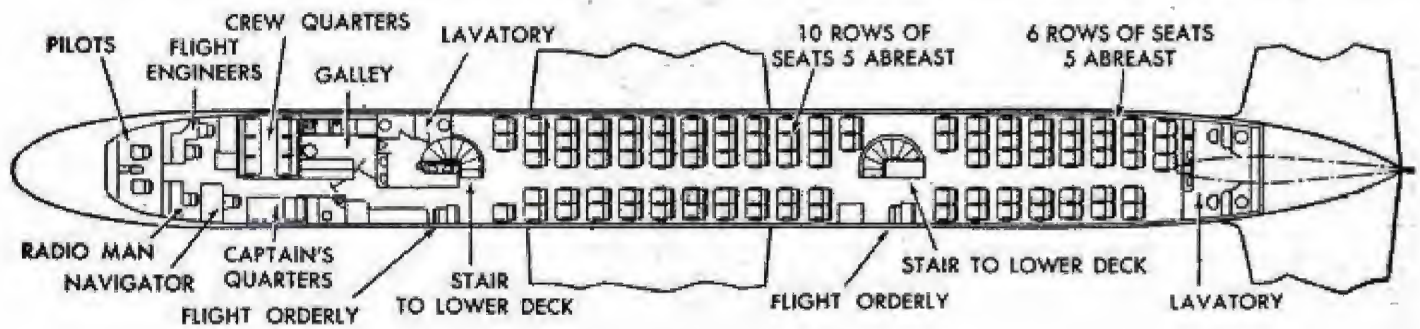
Left, largest passenger section is a 92-seat area midway in second deck. "Figure 8" fuselage is pressurized both in passenger and cargo spaces for flying at 25,000-foot altitude

Below, because the 'Constellation' will be called on for constantly varying transport roles, it was designed for speedy conversions. The lower deck accommodates cargo, seats, benches or litters in different combinations

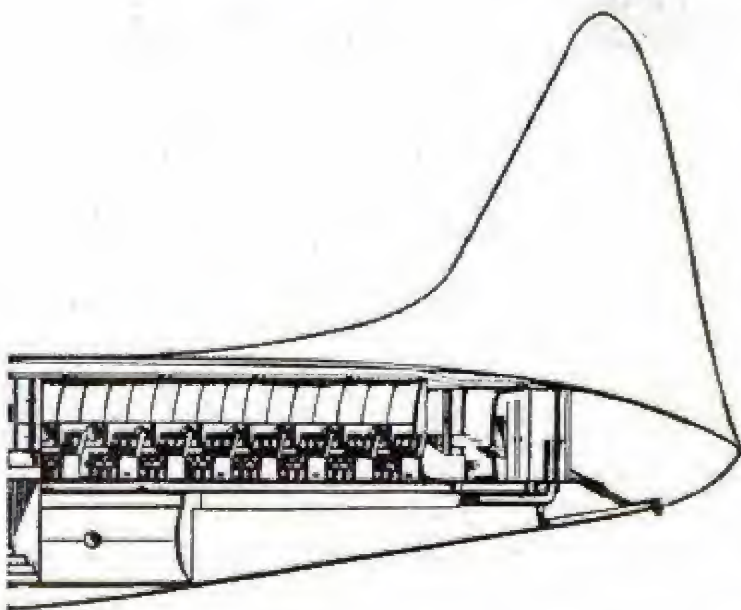




The new queen of Navy air dwarfs not only spectators, but a 39-foot transport built away back in 1936



Right, spiral staircases link upper and lower decks of giant air carrier. A proposed commercial version of Lockheed-built craft would sleep 100 passengers





Bicycle Built for Five

When youngsters at a Dutch school miss the regular bus they don't have to walk home. The school janitor gives them a ride on his bicycle built for five. Tandem seats, equipped with safety rails, over both front and rear wheels provide space for four children. It may be hard pedaling for the janitor, but the youngsters like it better than the bus.

"Air War" on Sagebrush

Sagebrush is being cleared from range land with a low-cost mixture of 2, 4-D, soda, Diesel oil and water sprayed from planes. One application is more effective than three successive annual mowings of the woody weeds, according to the U. S. Department of Agriculture.

Silage Loader

With a "wrap around" loader developed in England, silage can be quickly and conveniently moved with a minimum of handling. The loader consists of five flat metal sections joined by hinges. It is drawn behind the tractor by a tow rope and wraps itself around the silage, making a bundle which can be dragged across the ground.



Tiller Does Three Jobs

Plowing, disking, harrowing and fertilizer spreading are performed in one operation by the soil tiller, a new device for gardeners and small-scale farmers. It shreds and mixes weeds and cover crops into the top soil as it moves along at speeds up to 2½ miles an hour. Fertilizer is spread from a hopper and agitator attachment just ahead of the tines, which work it into the soil. The tiller weighs 225 pounds and runs four hours on a gallon of gasoline.

[[Ocean wave-bands detected on the southwestern coast of England have been traced to their origins as far away as the Antarctic Ocean.

LION HUNT

Call him cougar, mountain lion or panther — he's still the meanest citizen of the West. The modern sportsman tracks him with a pack of dogs and a hearing aid



TEN MINUTES after the dogs had been released from their trailer they pounced on a hot scent and began to track it across the dry wash, running in a group. They sounded like they meant business.

Bill Archer watched them until they were out of sight. "They've found a cougar," he said. "It's an open trail from the way the dogs are running and yet they don't have their heads up the way they follow a bear. We might as well relax for an hour."

The hunter waited an hour and then pulled from his pocket an electronic hearing aid, the type used by the hard of hearing. Holding it along the barrel of his gun and using the gun as a pointer, he slowly turned his shoulders and swept the horizon. Soon,

Face to face with 180 pounds of snarling mountain lion, this dog won't give an inch

Drop the tailgate of their trailer and the dogs leap out in search of fresh lion scent

By
Thomas E. Stimson, Jr.





With hearing aid beside his rifle the hunter pivots in a circle until he focuses on sound of yapping dogs, then takes off across country toward pack



In night hunting a spotlight is thrown on lion attracted by penned sheep
↓ Grown lion is held at bay by dogs wary enough to stay out of claw range



over the magnified roar of the stiff breeze and the clashing of leaves, he picked up a faint yapping. It was the dogs. "They've circled around to the north," he reported, "and it sounds like they have the cat up a tree. Let's go."

The cougar or puma is the most ferocious native animal of North America. It is a big beast, averaging 150 pounds. Some specimens in excess of 225 pounds have been taken. A large tawny-colored lion may stand hip high and eight feet long. Also called mountain lion, panther, painter or catamount, it roams over most parts of the West.

The cougar is one of the few wild animals on which there is no closed season. It is an outlaw, the king of predators, and its regular ration is one full-grown deer or the equivalent in sheep or cattle every week. Strong enough to knock down an animal several times its size, it has heavy shoulders, large retractile claws with terrific ripping power and a heavy-boned jaw

for slashing and biting. It makes a stealthy approach on its big cushioned feet, pounces, and kills with claws and teeth.

Professional hunters are always on its trail and lately more and more sportsmen have taken up cougar hunting.

Archer and his friends Jack Cunningham and Phil Rickman of North Hollywood, Calif., are among the latter group. In the last 10 years Archer's pack of hounds has captured 25 cougar in addition to 100 bear and 175 bobcat. Running the dogs is a strenuous sport and until recently Archer and his friends used to wear themselves out. Three hours or more of jogging along canyon bottoms, climbing across mountains and plowing through brush will tire anyone. Now the hunters have a stunt that saves breath and shoe leather.

The electronic aid more than doubles the acuity of the sense of hearing and allows a hunter to locate his dogs when they are well beyond normal listening range. Quite often the pack chases an animal for 10 or 15 miles on a circular trail that winds up only a few miles from the starting point. Instead of following his dogs, Archer gives them time to free their quarry and then listens in, locates the pack and hikes straight to it.

The hearing aid is fairly directional and usually the hunter can spot the dogs by their barking. If it's hard to get a good bearing in mountainous country, one of the hunters takes a second hearing aid and walks about a quarter of a mile away. Both he and Archer tune in on the dogs and then by triangulation they pinpoint the pack.

Virtually extinct in the eastern states, cougars are most abundant in the Rocky Mountain region and in the desert areas of Texas, New Mexico and Arizona. They are found all through the Pacific Coast states. There are stories that they have attacked grown men and occasionally have killed and eaten children. A big mountain lion can kill a large calf, sling it over its back and run off. Cougars prey on mares, colts, young cattle, sheep, goats and pigs.



Two lions rest in a treetop in Glacier National Park. Such parks are the only areas where these vicious predators can't be hunted

Kneeling on a ground cloth, a hunter sets a trap for a bobcat. Large trap at right will be set in an effort to trap a cougar





Hunter will reach up with chain snare on rod to catch wildcat

Sportsman shows off large bobcat shot with high-powered rifle



A cougar that gets into a herd of sheep is apt to go on a rampage and kill ruthlessly until exhausted. Ten sheep were killed in 10 minutes by one cougar that was driven away before it could do more harm. Another cougar slew 192 unguarded ewes in one night.

Capturing one of these outlaws alive is a risky undertaking, yet it can be done. Roy Johnson of Provo, Utah, is said to have captured 75 of them, mostly for zoos and Lions Clubs.

Recently Johnson captured a 190-pound male after his dogs had pursued it for five hours. The lion was perched in a tree when the hunting party approached. The animal sprang down into the center of the group of men, horses and dogs. After scattering the hunters the big cat climbed another tree. Johnson started up the tree with a wire-reinforced rope and the cougar jumped again, running a short distance and taking shelter in a third tree.

Johnson climbed to within eight feet of the beast, got the rope around its neck and dropped the rope to his helpers on the ground. They pulled the animal out of the tree and Johnson grabbed its long tail, stretching the animal out until it was helpless. The fore paws were tied together, the hind paws lashed with rope and a stick was thrust between the animal's jaws and tied down. Trussed like this, the cougar was brought out of the mountains on horseback.

A grown cougar rarely can be tamed and must be kept caged. The exception is the big cougar that you occasionally see in motion pictures. It was captured when only a few weeks old after its mother, a notorious cattle killer, was tracked down and slain in Oregon. Curley Twiford of Hollywood raised the cub, gentled it and trained it to work in pictures. Some day it may revert to its traditional temperament, but so far it has been well behaved.

The campaign against cougars never lets up in the cattle states. They may be shot on sight, anytime, anywhere except in national parks and monuments. They are hunted with dogs, poisoned, trapped and shot after dark with the aid of spotlights, a practice that is illegal for taking most kinds of

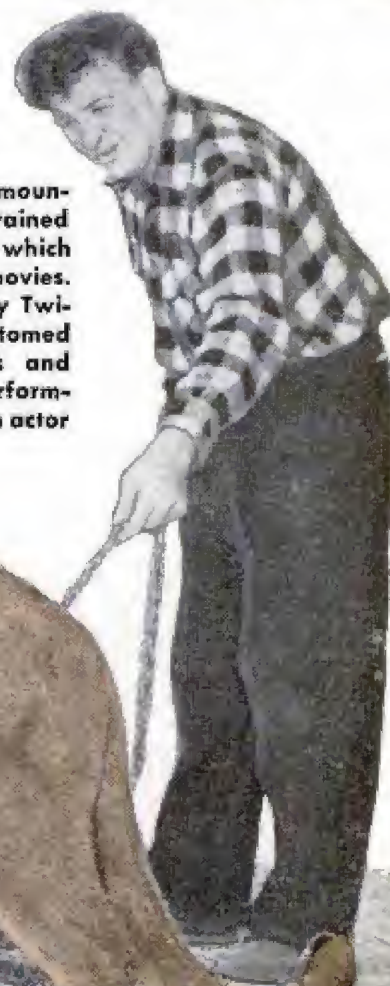


game. Nevertheless, they seem to be holding their own.

In California, for instance, the state has paid bounties on 9905 mountain lions since 1907 and still some 250 fresh pelts continue to be turned in each year to the Bureau of Game Conservation. The California state bounty is \$60 on females and \$50 on males. Other states post similar bounties and some counties offer additional rewards. Salaried state and federal predator hunters trail the lions with dogs or set traps for the animals.

(Continued to page 232)

One of the few mountain lions ever trained is this specimen which appears in the movies. Raised by Curley Twiford, it is accustomed to studio lights and turns in the performance of a veteran actor





Harness-Race Starting Gate Has Telescoping Arms

Mounted on the rear of a convertible, telescoping arms with an 80-foot "stretch" comprise the newest starting barrier for big-league harness horse racing. The sectioned arms are extended from their closed width of approximately eight feet by air pressure and are drawn back by electrically operated wind-up steel cables. All con-

trols are centered on a pulpit panel, where the starter sits facing the racers. The car is specially equipped with a high-ratio drive so that it can pull away from the starting horses, which quickly reach a speed of 30 miles an hour. A light on the dashboard signals the driver when the arms are drawn in.



Snap-On Initials for Automobile

Motorists can personalize their automobiles with a chrome-plated initials holder that attaches to the car with two self-threading sheet-metal screws. Three initials are provided with the set. They are embossed on brass sheets and crimped over the spring-prong buttons. Both the black lacquer background and the brass letters are lacquer coated to prevent corrosion. The holder is placed just below a window or on any flat surface of the car.

Tubes Judge Cotton Fibers

Cotton fibers are measured quickly and accurately by an electronic instrument that takes over the laborious work of classing fibers by projection. The information is vital to the textile industry. Samples of parallel cotton fibers are clamped in the instrument, which scans them with light-sensitive photo tubes. The machine traces a curve on a sheet of paper which gives information on the fibers including average length and variance.

Half of the 6,000,000 farm families in the United States now rent frozen-food lockers in the nation's 9500 freezing plants.





Rail Recreation Car

Time passes quickly aboard a recreation car that provides entertainment for adults and a playroom for the youngsters. The car is one of three that will be in daily service for the Pennsylvania Railroad between New York and St. Louis. At one end of the car is a miniature theater where the latest newsreels are shown continuously by an automatic projector. In a buffet section built below the level of the floor, passengers can order sandwiches and refreshments. A compartment for radio, sound reproduction and public-address equipment separates the lounge from the playroom. Inside the playroom are a miniature table and chairs, blackboard, upholstered play pen, tiny sofa and an ample



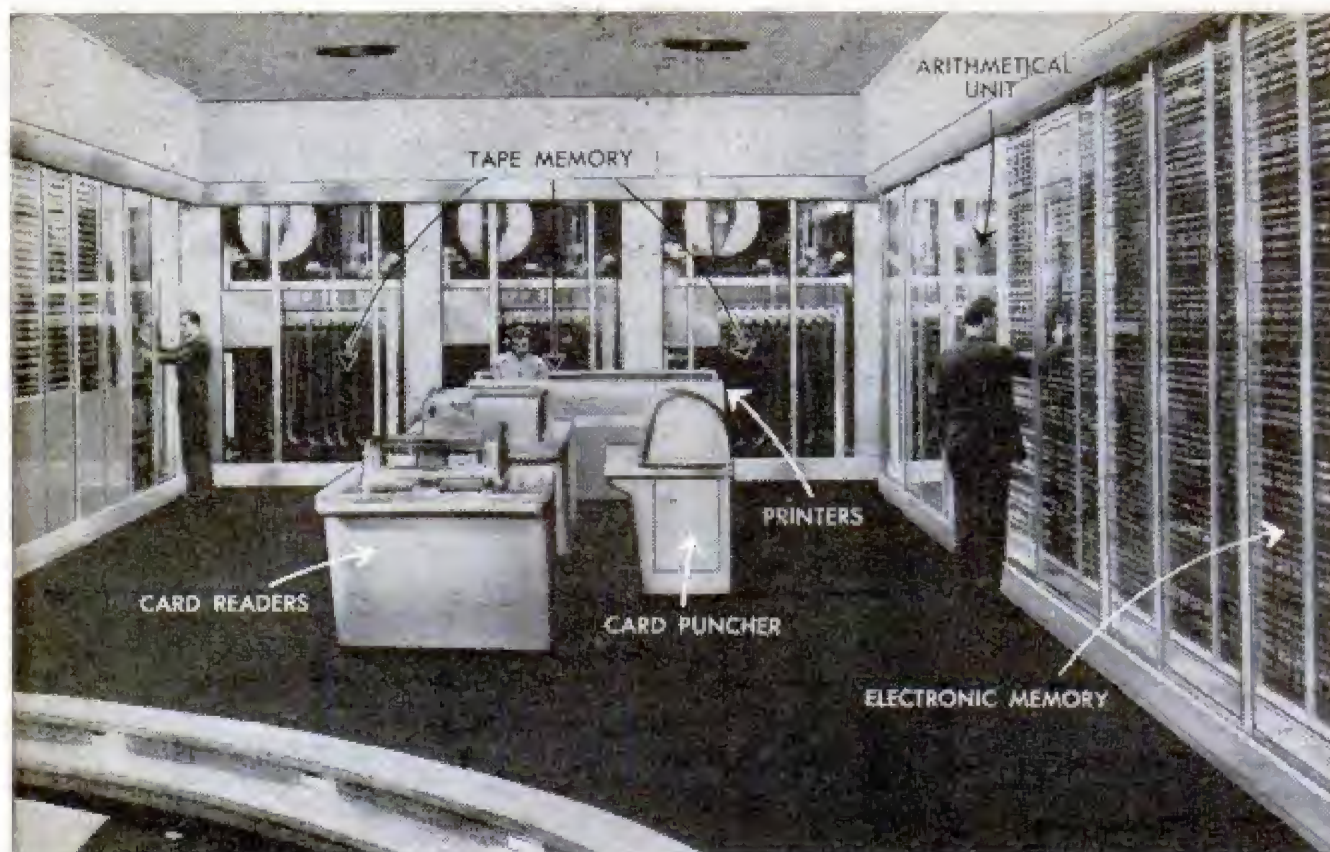
Top left, stewardess reads to children in playroom and at right, refreshments are served in buffet. Above, in tiny theater newsreels are shown continuously

stock of toys. A stewardess takes care of children in the room. At the end of the car is a game and reading room with facilities for card playing, and letter writing. Parents in this room can watch their children through a large window.



Huge Bridge Girder Spans Five Flatcars

One of the largest girders ever fabricated needed five flatcars for its ride to the Sheboygan River in Wisconsin, where the Chicago & North Western Railway is building a bridge near Sheboygan. Fabricated by the American Bridge Company at Gary, it is 162 feet long and weighs 150 tons.



Electronic Calculator Has 12,500-Tube Brain

Remembering a telephone number is simple for a new electronic calculator with a memory capacity of 400,000 digits. The new machine, built by International Business Machines Corp., is the first to combine electronic calculating speed, vast memory capacity and highly flexible facilities. Numbers to be recalled most quickly are held in electronic circuits while others are stored in relays and as holes in continuous paper tapes. By using punch cards, its

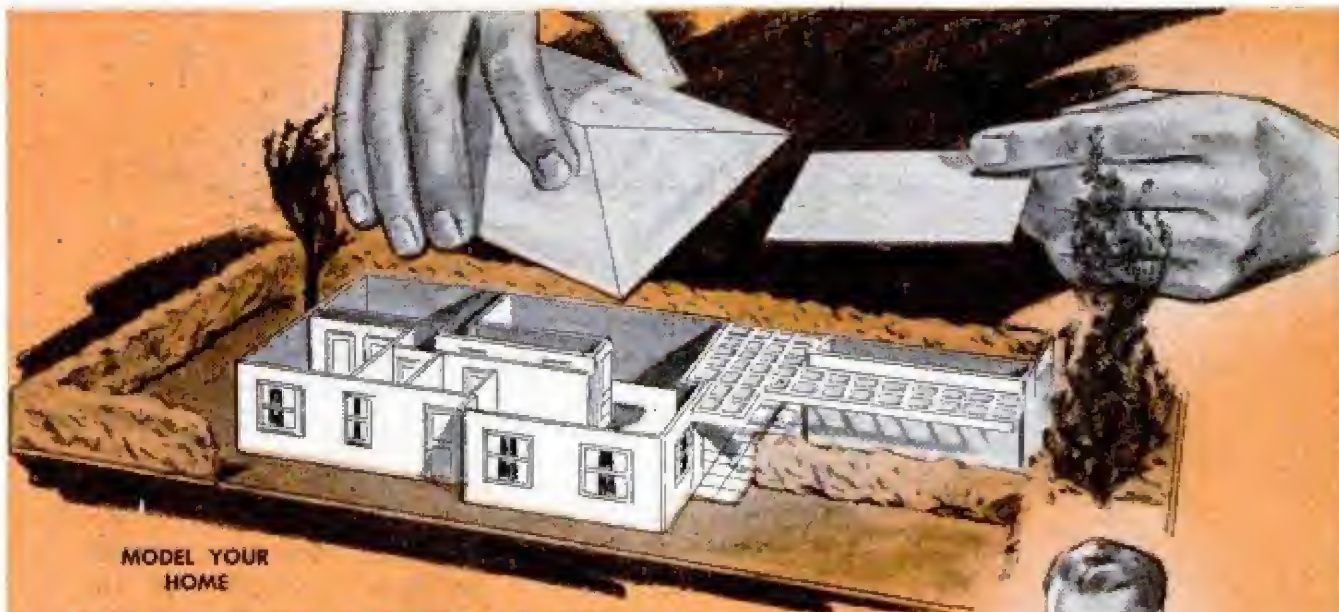
memory capacity is almost limitless. It can add or subtract every second 3500 numbers of 19 digits each; it can multiply every second 50 numbers of 14 digits each or divide 20 numbers of 14 digits. To make this possible it has a circuit containing 12,500 tubes. The machine will eliminate much expensive experimentation by finding the answer mathematically. Heretofore such "testing" has been too laborious and time-consuming to be practical.

Diamond Tool Turns Out Eyeglass Lenses to Prescription



Spectacle lenses are cut accurately and automatically by a diamond-impregnated tool that doubles the production of hand-grinding methods. The tool is held in a machine that is preset to cut both spherical and cylindrical curves on the lens surface in one operation. A scale guides the operator in turning the machine's head until the tool is at the proper angle to cut the desired combination of curves. The lens is embedded in pitch during the grinding. Because of the wide range of curves that can be cut with the machine, 92 percent of all eyeglass prescriptions can be handled without hand grinding.

Information, including manufacturers' names, concerning products described in this issue may be obtained by writing Bureau of Information, Popular Mechanics, 200 E. Ontario St., Chicago 11, Ill.



The CRAFTSMAN

★ A new angle in home planning is scale-modeling the structure before it is built. From this you get a realistic, three-dimensional view of your dream home just as it will appear when finished. You then can study it at leisure, make changes without additional cost, "plant" trees and shrubs wherever you like—all before the carpenter drives a single nail. By following details of the story on page 184 you can build a scale model of your home during one week end.

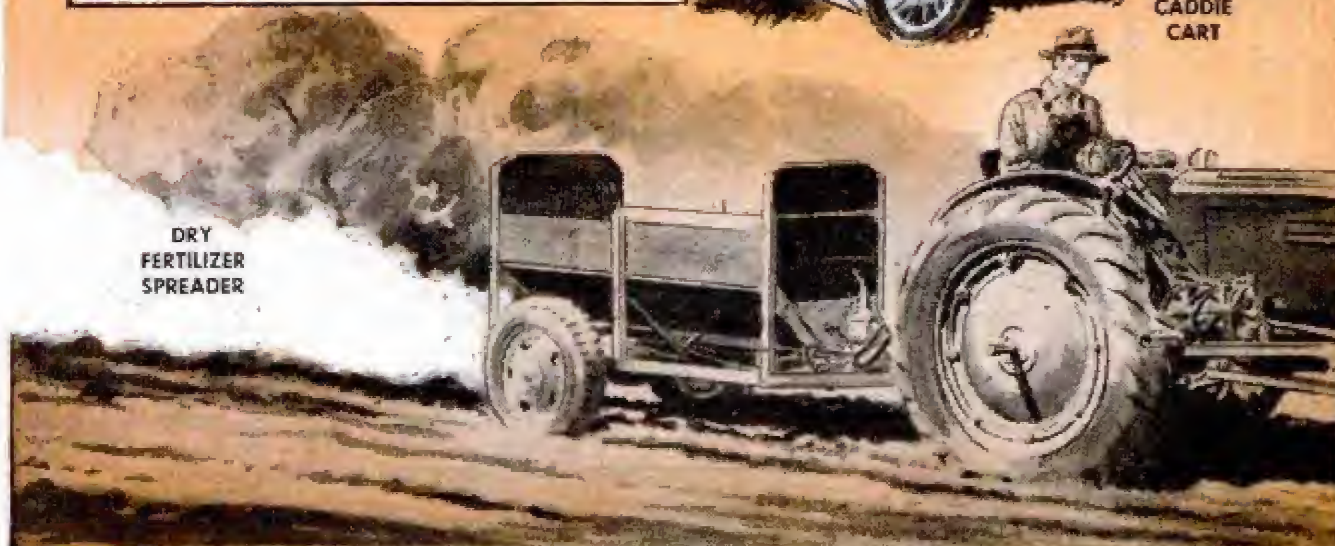
★ An aluminum caddie cart providing separate racks for woods and irons, and locker space for accessories should fulfill the needs of any golfer. A good way to get one is to study the constructional details on page 198, and then build it yourself.

★ Farmers confronted with the job of applying dry fertilizer will find it profitable to build the spreader described on page 209.

★ Look for the shop feature on page 217. It deals with methods of preventing warped boards, building up wide, nonwarping panels from narrow strips, etc.



DRY
FERTILIZER
SPREADER





The chair goes together in a jiffy. Just open up the sides, raise the seat, insert the back in the slots and push down to interlock the parts

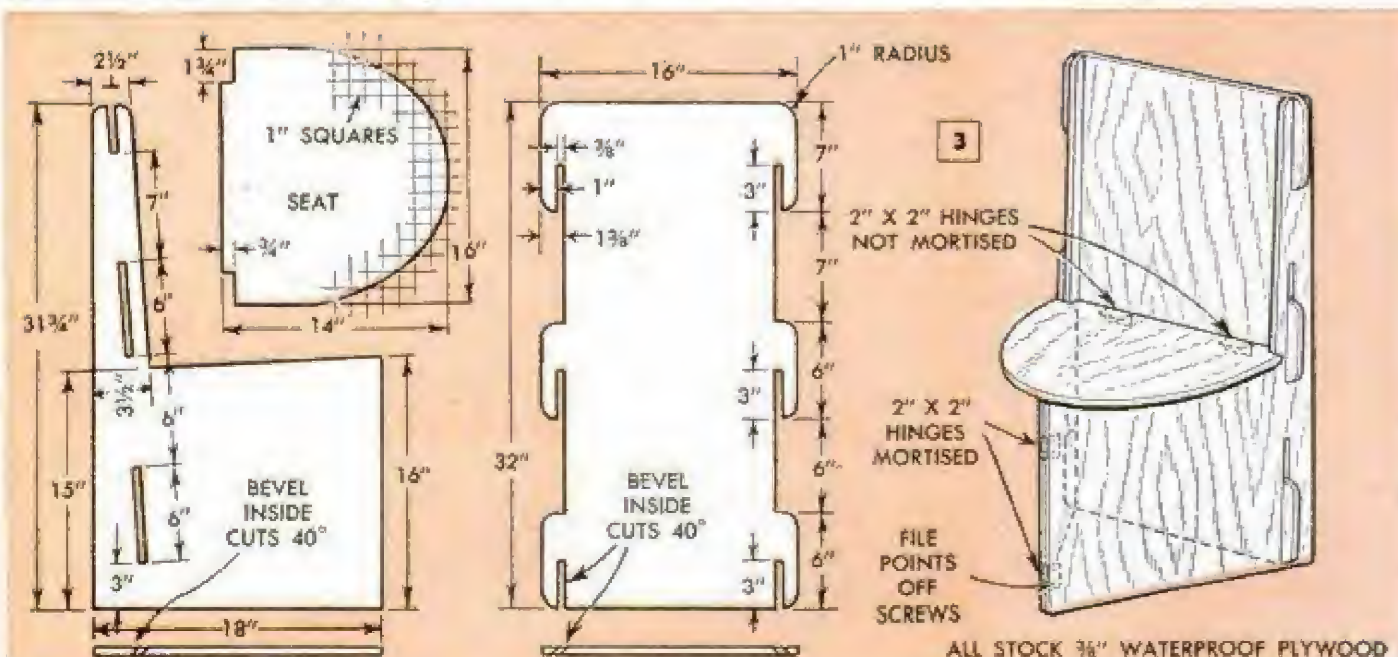


Tuckaway Picnic Furniture

By Keith Vining

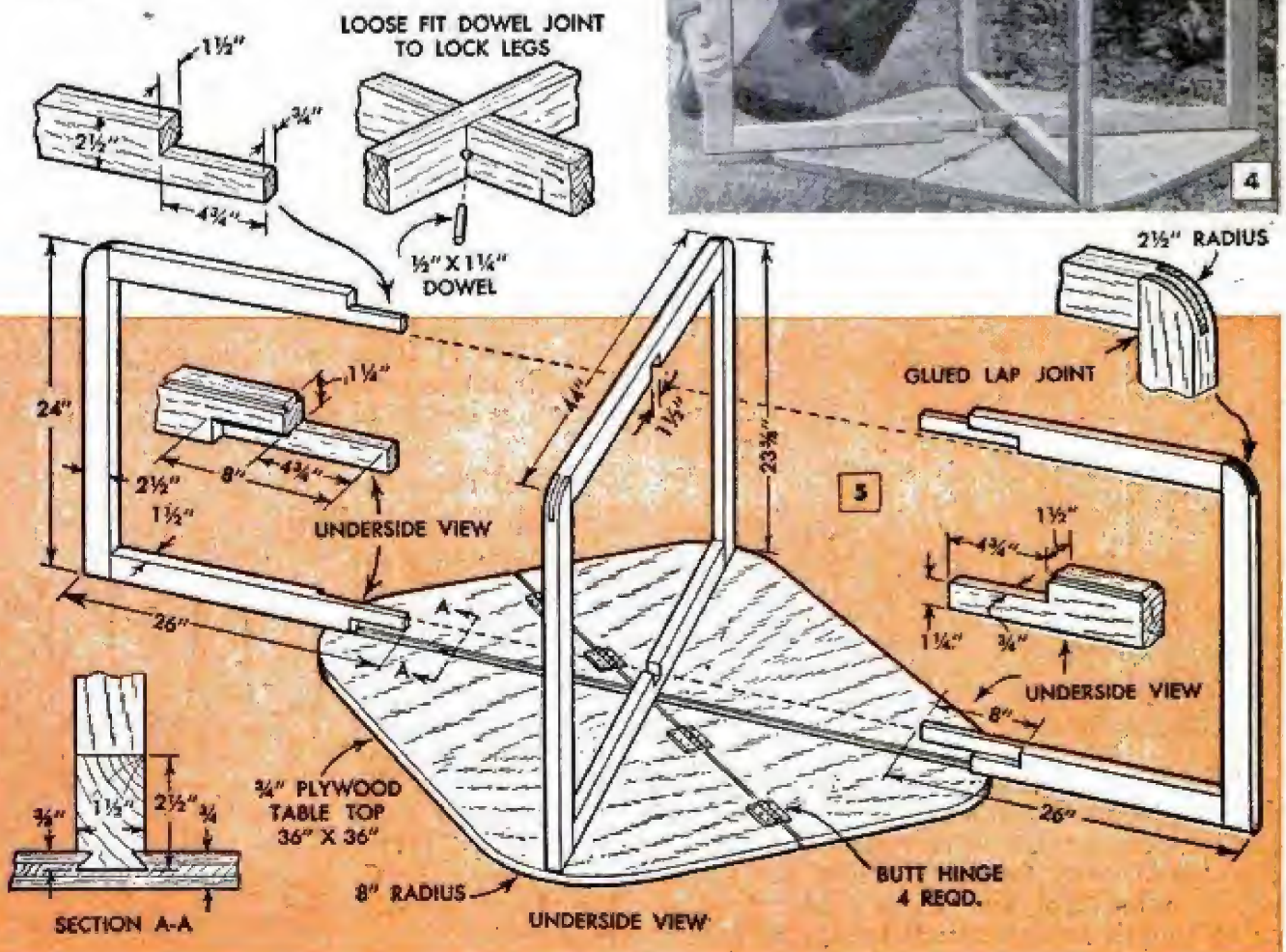
JUST the thing for outdoor dining in your back yard or on a picnic, this novel plywood table-and-chair set comes apart so that it can be transported easily or tucked away in the fall in a minimum of space. Each chair consists of four parts, the sides being exactly alike, except for the slots. Fig. 3 gives the patterns for the parts which are cut out of $\frac{3}{8}$ -in. waterproof plywood. The sides of the chair are mortise-hinged together at the front, while its seat is surface-hinged to the back to fold downward. The slots must be cut to slant inward and accommodate the chair back. Cut them slightly oversize to allow for coats of paint or varnish. To set up a chair, you merely open its sides, Fig. 1, lift up the seat, engage the back piece in the slots and then push down on the back to interlock all of the parts as in Fig. 2.

The top of the table is a piece of plywood, 36 in. square, supported by "frame" legs, one frame being made in two separate parts which slide together in a dovetail groove on the underside of the top, Fig. 4, and interlock the complete assembly. The only fastening used is a removable dowel which pins the sliding legs together. The frames are assembled with open-mortise corner joints, as detailed in Fig. 5. Note that the crossrails of the solid frame are notched to take the ends of the sliding frame. The sliding frame has a dovetail tenon cut in the top edge to match a dovetail groove in the table top. The best way to cut the groove is with a portable router, equipped with a dovetail cutter, guiding it along a straightedge placed diagonally across the plywood and clamped. After the groove is made, the top is cut exactly in half and surface-hinged. When the table is assembled, a hole is drilled through the cross joint formed by the two frames and a dowel is inserted in the hole to lock the parts together. The dowel can be tied to the legs for safekeeping.

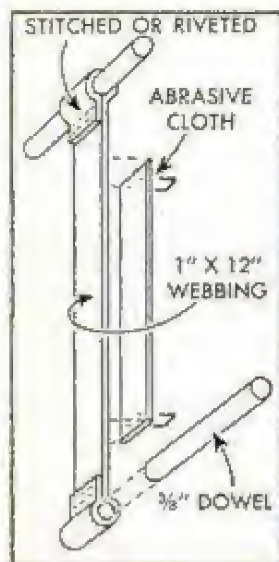




Although outdoor plywood is recommended for this furniture, it should be protected against moisture by finishing both sides and all edges of the parts with two coats of weather-resistant spar varnish. Sand the parts first, and as a touch of decoration, decals can be applied when the first varnish coat is dry. Then the second coat will protect the decals and keep them looking bright. Avoid making the sliding joints too snug as they should be a loose fit. Waxing will help if the parts do not slide freely

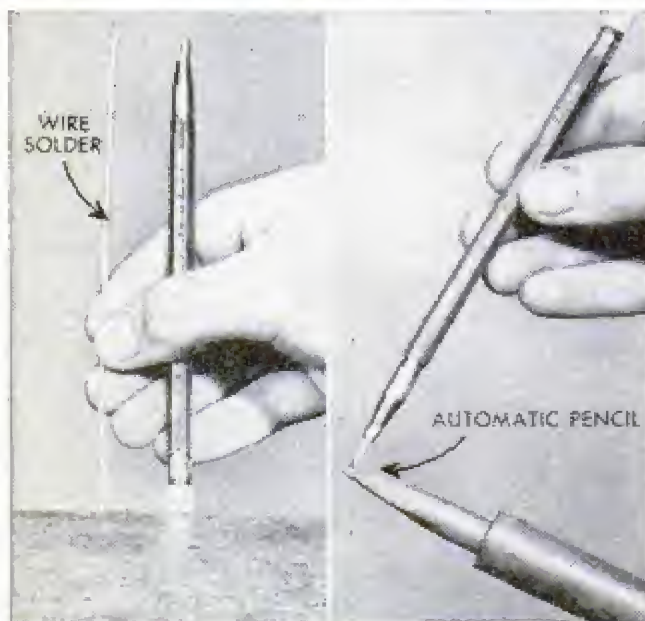


Wood Turnings Sanded Safely By Using Abrasive Holder



Using narrow strips of abrasive cloth to finish wood turnings in a lathe may be dangerous because the cloth, unless held carefully, may wrap around the work and catch the fingers. With this holder, however, the chances of injury are lessened. Two $\frac{3}{8}$ -in. dowels are used for handles and a 1 by 12-in. strip of webbing with the ends stitched or riveted around the handles serves as backing for the abrasive cloth. Staple the cloth to the webbing so that it can be removed easily.—Albert M. Lindner, Jr., Cold Spring, N. Y.

Automatic Pencil Holds Wire Solder



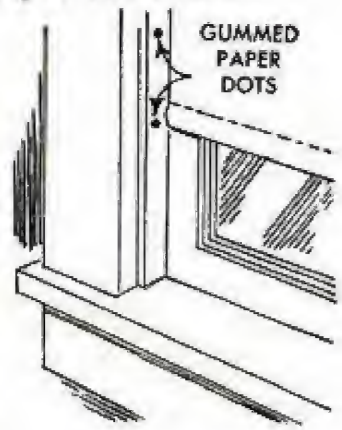
An automatic pencil that will accommodate large-sized leads can be used to hold and dispense solid wire solder. This is a convenient way to carry solder for small repair jobs. Cut the wire solder to the same length as the pencil lead, and insert

it in the pencil barrel with about $\frac{1}{2}$ in. projecting. Solder is fed from the pencil in the same manner as the lead.

H. Leeper, Canton, Ohio.

Shades Kept at Uniform Height With Gummed-Paper Markers

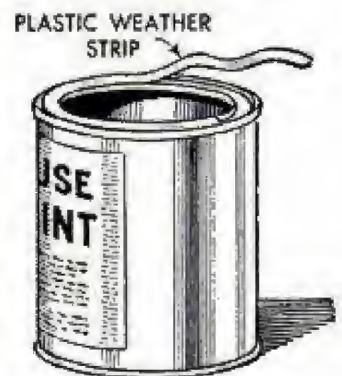
Keeping window shades in your home at the same height is easy if small paper dots are glued to the stop along one side of each window and used as guide markers. Beginning at the top of the window, space a row of dots 3 or 4 inches



apart, or merely place one dot at the position where you prefer to keep the shade. While the paper guide markers will not be noticeable behind curtains or drapes, it is best to use dots of an inconspicuous color.

Rim of Paint Can Kept Clean To Effect Tight Seal

To keep the rim of a can of paint free of hardened paint accumulations so that the cover will make a good seal, fill the groove with a length of plastic weather strip each time before you paint from the can. Rope-



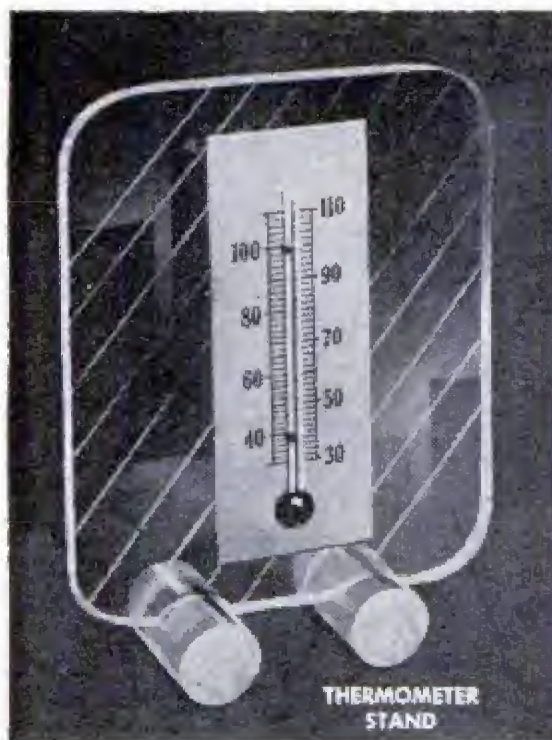
type calking compound which is sold in roll form is ideal for this purpose. Although not as satisfactory as a plastic compound, a length of cord also may be used.

Altered Hammer Head Speeds Nail Pulling

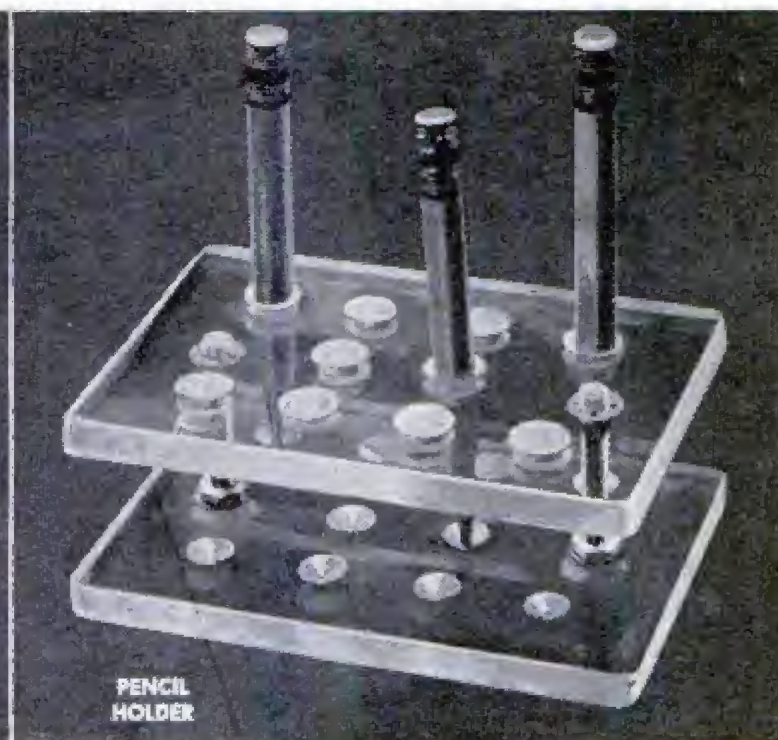
By grinding off the neck and poll of an old claw hammer you can improvise a handy nail puller. The increased leverage afforded by the rounded head makes pulling nails easy.—H. C. Kenly, Summit, N. J.



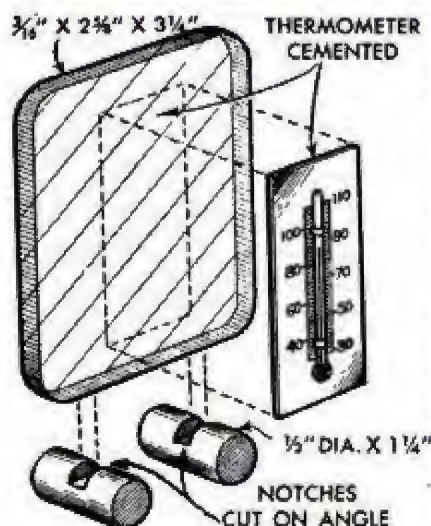
Two Desk Accessories From Scraps of Plastic



THERMOMETER
STAND

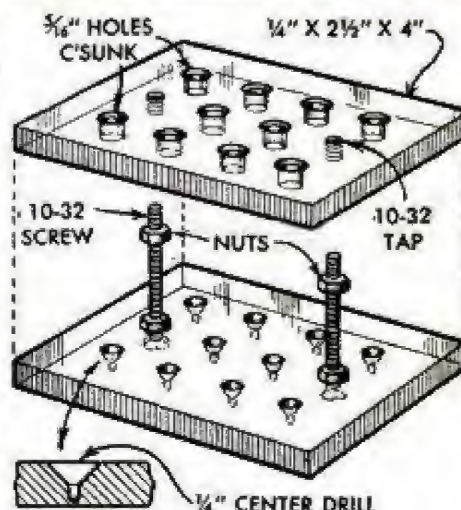


PENCIL
HOLDER



THERMOMETER STAND requires 3 pieces. The corners of the panel are rounded and then lines are scribed diagonally across the rear surface with a pointed tool. The feet are notched at an angle to give the stand a backward slant. The thermometer is cemented in place

PENCIL HOLDER accommodates 10 pencils. Holes are drilled completely through the top piece, while those in the bottom piece are made blind to take the pencil points. Machine screws, with the heads cut off, are turned into tapped holes to space top and bottom about 2 in. apart



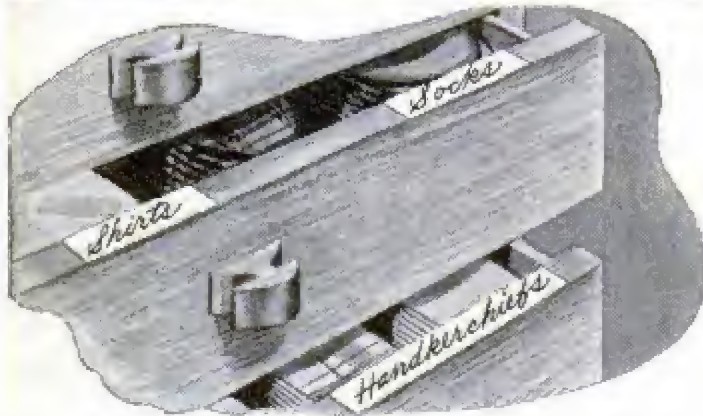
Oilcloth Wrapper Protects Blueprints When on Construction Job



Blueprints are less likely to become soiled and torn on the job while not in use if an oilcloth wrapper is provided in which they can be rolled. The wrapper should be slightly wider than the blueprints and about half as long. It is attached with cellulose tape to the bottom sheet of the set of prints opposite the stapled end. After rolling the blueprints, continue to roll them in the oilcloth wrapper to form a protective cover. The ends of the cloth are tucked in to prevent unrolling. This also is a good way to protect blueprints when in storage.

☐ When painting a small room where the odor of paint is objectionable, you can effectively kill the turpentine odor by adding a teaspoonful of vanilla extract to each gallon of paint. The vanilla will not discolor even white paint.

SOLVING



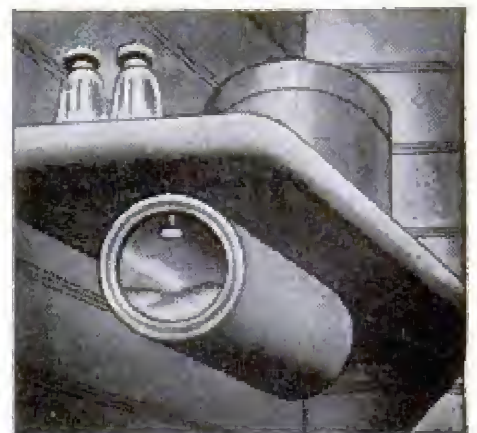
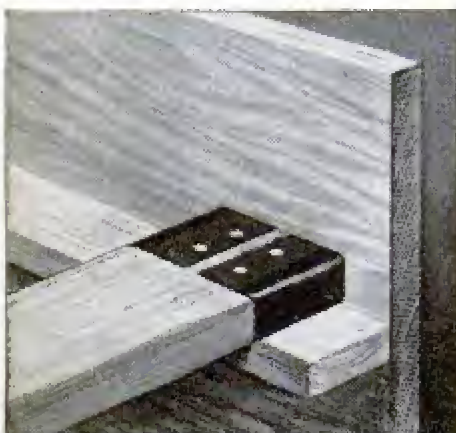
Picking up a phonograph-record album upside down and having the records fall out can be prevented if the top of each album is marked with a tab of adhesive tape. The tape indicates at a glance which end is right side up. This precaution prevents breakage when replacing the albums

Contents of a chest of drawers (left) are kept in order by labeling each drawer. Simply write the name of the article, such as socks, shirts, and handkerchiefs, on a strip of adhesive tape and apply it to the top edge of each drawer where it will not show when drawer is closed

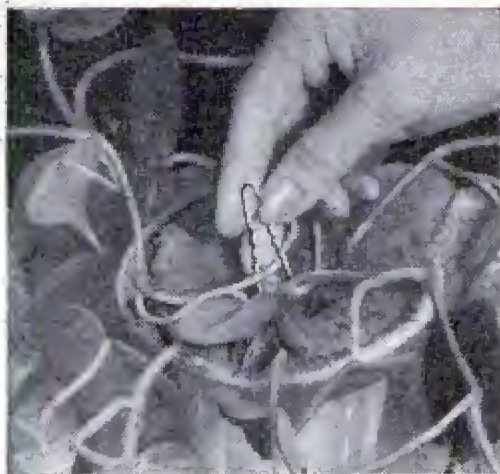
Bed slats are made nonsliding by wrapping each end with a strip of rubber and tacking it to the slat. Rubber from an inner tube will do as it will provide a friction surface to keep the slats from shifting and falling out

A good way to store a small step-ladder when not in use is to hang it between two slanting cleats attached to a wall or door. Space the cleats so that they hook under the top step, and fasten with screws

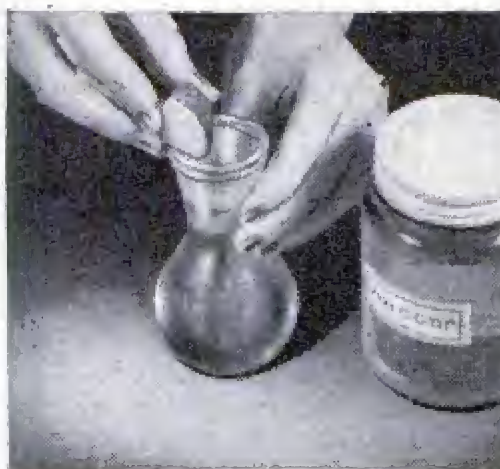
Roach powder is safe to use in a pantry if it is placed in an open-end can tacked to the underside of a shelf. Held in this manner, it is away from food yet still attracts roaches



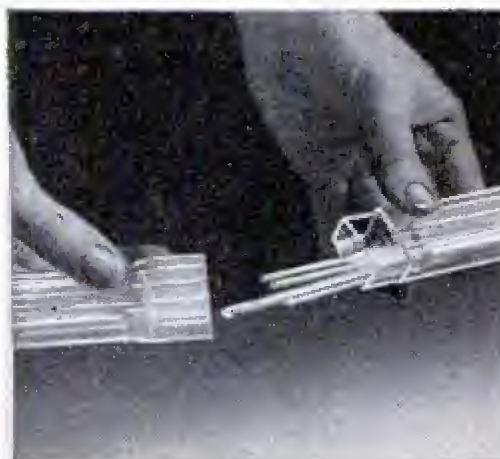
HOME PROBLEMS



If you want to root cuttings of a plant having a jointed stem, use hairpins to anchor the cuttings in the soil at the proper depth. The pins are inconspicuous, will not injure tender shoots and are removed when the cuttings have taken healthy root



To clean the inside of a vase having an odd shape, place small pieces of raw potato in the vase and fill it with vinegar. Let it stand overnight. Shake vigorously, wash in soap suds and rinse in water



Plastic toothbrush containers make excellent protective cases for storing crochet hooks. Being transparent, the case permits selection of the hook desired without removing it to see the size number

Baby's bibs, rattles and toys (right) can be kept handy by hanging them on screw hooks installed on the back of the high chair. If the points of the screws project through, file them off



When the lifting tab on a milk-bottle cap tears off, don't use a fork to remove it each time. Instead, wrap the cap in a piece of wax paper and twist the corners to form a convenient handle. The paper will not interfere with capping of the bottle



Name Inscribed on Bamboo Rod Is Permanent Identification



Bamboo fishing rods may be identified permanently by autographing them with your own name or initials. First, rub a small area of the rod with fine steel wool to remove the varnish, and then write on this part with India ink. After the ink has dried, cover it with a coat of varnish.

R. A. Jenkins, St. Louis, Mo.

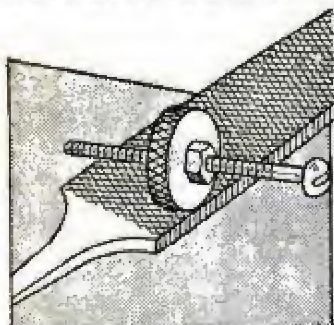
Wrench Provides Comfortable Grip For Pail With Wire Bail



When carrying heavy material in a pail that does not have a wooden handgrip, the wire bail can be prevented from "cutting" your fingers if a handle is improvised by placing an alligator-type wrench

or a common end wrench under the bail as shown. The wide, flat handle of the wrench provides a comfortable handgrip.

Flat File Forms Substitute Tool To Knurl Soft Brass



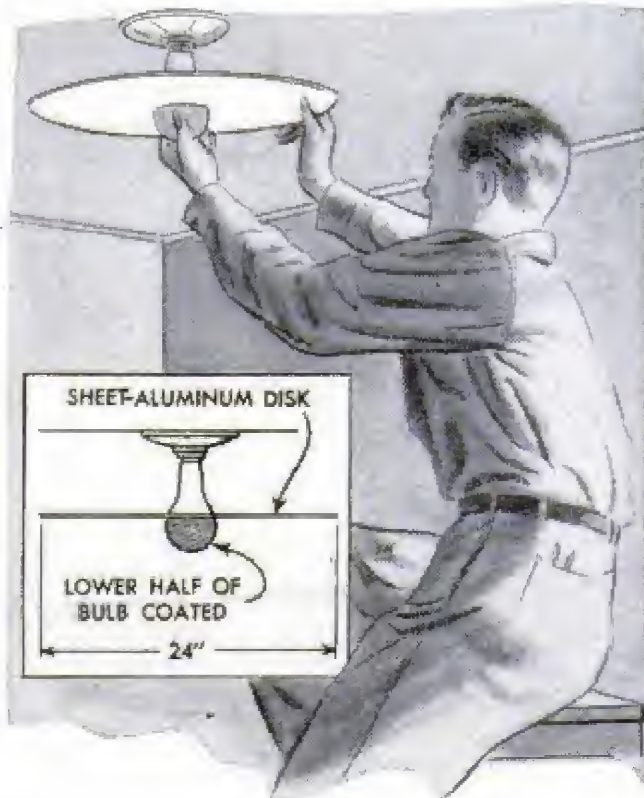
Where you have an occasional knurling job which does not warrant investing in knurling equipment, a flat file clamped in a vise will produce a satisfactory knurl in

soft brass or plastic. If a diamond-pattern knurl is desired on a small handwheel, roll the part along on a double-cut file while exerting a steady downward pressure. If the knurl is not deep enough after the first pass, roll the work back along the file without moving it out of position. To make a straight knurl, use a single-cut file and slide the part back and forth parallel with the cut of the file, gradually turning it. If the work is drilled through the center, it can be made easy to rotate and manipulate by mounting it on a machine screw with a nut on each side, so that the ends of the screw serve as handles.

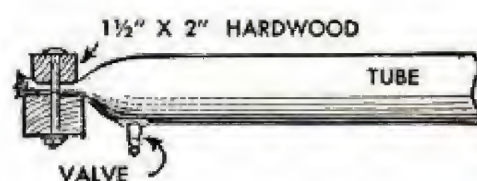
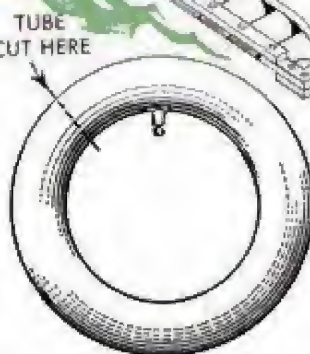
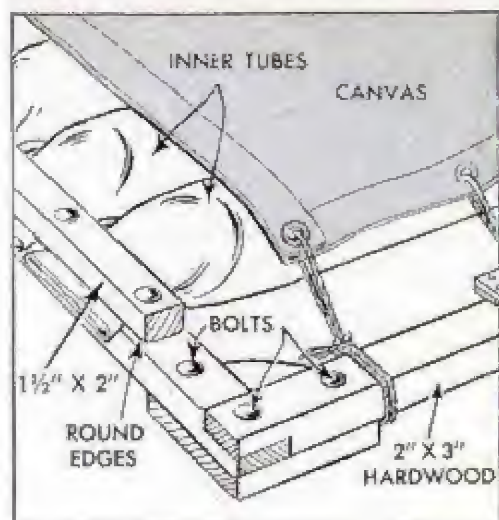
Inexpensive Ceiling Fixture

If you are fixing up a basement recreation room and are looking for an inexpensive indirect-lighting fixture, here's one that is modern in appearance and extremely easy to make. It's nothing more than a 24-in. disk of sheet aluminum, with a hole in the center, supported by a standard bowl-type bulb which has a silver coating over the lower half to reflect the light upward. The hole in the disk should be of a size to permit the reflector to rest horizontally on the bulb at the point where it is coated. Galvanized sheet metal also can be used for the reflector, although a highly polished metal, such as aluminum or tinplate, is preferred as it will provide better reflection. The underside of the reflector can be painted to match or harmonize with the color treatment of the room. Silver-coated bulbs can be purchased at any electrical store.

Elmer T. Prill, Detroit, Mich.



Fun Galore With This Inner-Tube Beach Raft



Inflated inner tubes stretched and clamped to a hardwood frame provide a novel way of rigging a lightweight raft for your back-yard pool or for use at the beach. If standard 6.00x16 tubes are used, the raft can be made about 4½ ft. long. A longer one may be had by using tubes of larger size. The width of the raft depends on the number of tubes. The frame corners are half-lapped, as shown, and bolted to hardwood blocks placed on the underside. Hardwood strips, which clamp the ends of the tubes to the frame, are drilled for carriage bolts, the holes being spaced to straddle each tube. Aligning bolt holes are drilled through the frame at the same time and the bottom edges of the clamping strips are rounded to prevent them from cutting the rubber.

The tubes are cut at the point indicated and are placed in the frame so that the valve stems point downward. To assure an airtight seal, the ends of the tubes should be vulcanized or cemented shut by rough-

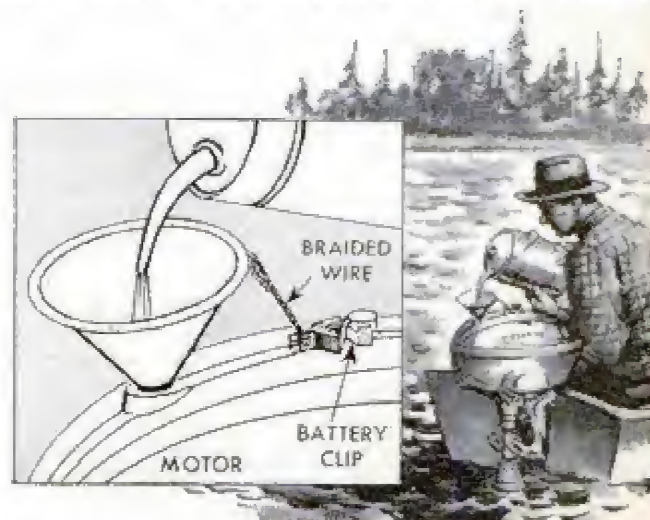
ening contacting surfaces and coating generously with tire-patch cement. A wooden hand screw, or a vise, will be helpful in clamping the ends after the cement is applied. Before clamping the tubes to the raft frame, inflate each one and test it underwater to see if it leaks, and then deflate it. Line up the tubes side by side and bolt on the clamping strips. Bolt the two side members to one end member and then, with someone to assist, force the opposite end member in position. Inflate the two outside tubes first, then two adjacent tubes at the center of the raft. Finally, inflate those remaining. A canvas cover, fitted with grommets along two sides, is drawn over the tubes and lashed to the frame.

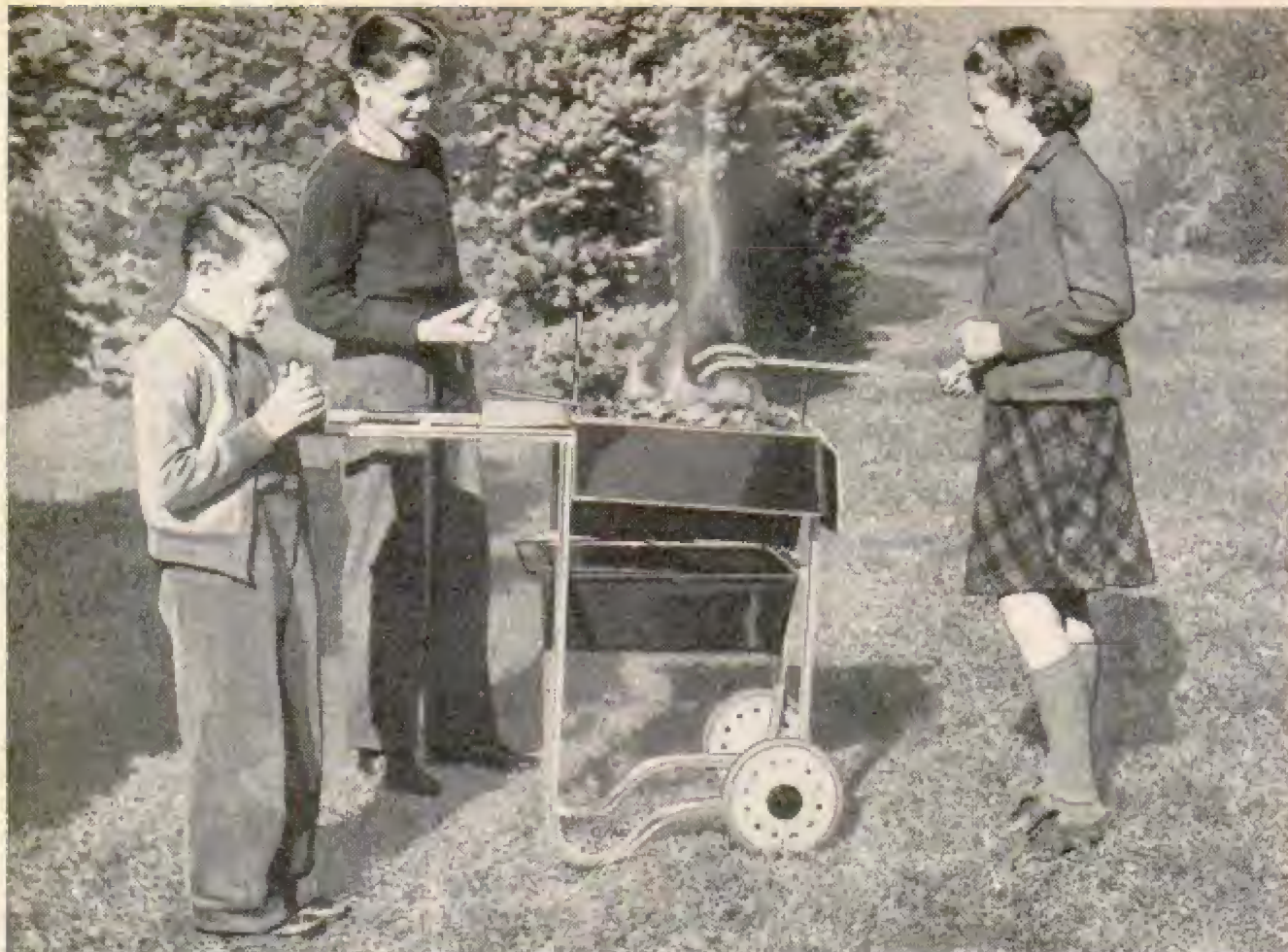
C. L. Meehan, Lakeview, Ont., Can.

Wire and Battery Clip Hold Funnel to Fill Outboard-Motor Tank

If you have ever run out of gas and have had to fill the tank of an outboard motor in choppy water, you'll appreciate this simple stunt for preventing the funnel from jumping out of the filler hole. Drill a small hole near the rim of the funnel and attach a short length of trolling wire of the braided type. Then solder a small battery clip to the other end of the wire. In use, the clip is attached to any convenient place on the motor. The stiffness of the wire will keep the funnel in the filler hole and yet will allow it to be removed readily and clipped to the handle of the gasoline can for safekeeping.

Martin L. Spangler, Knoxville, Tenn.





BAR-B-Q CART

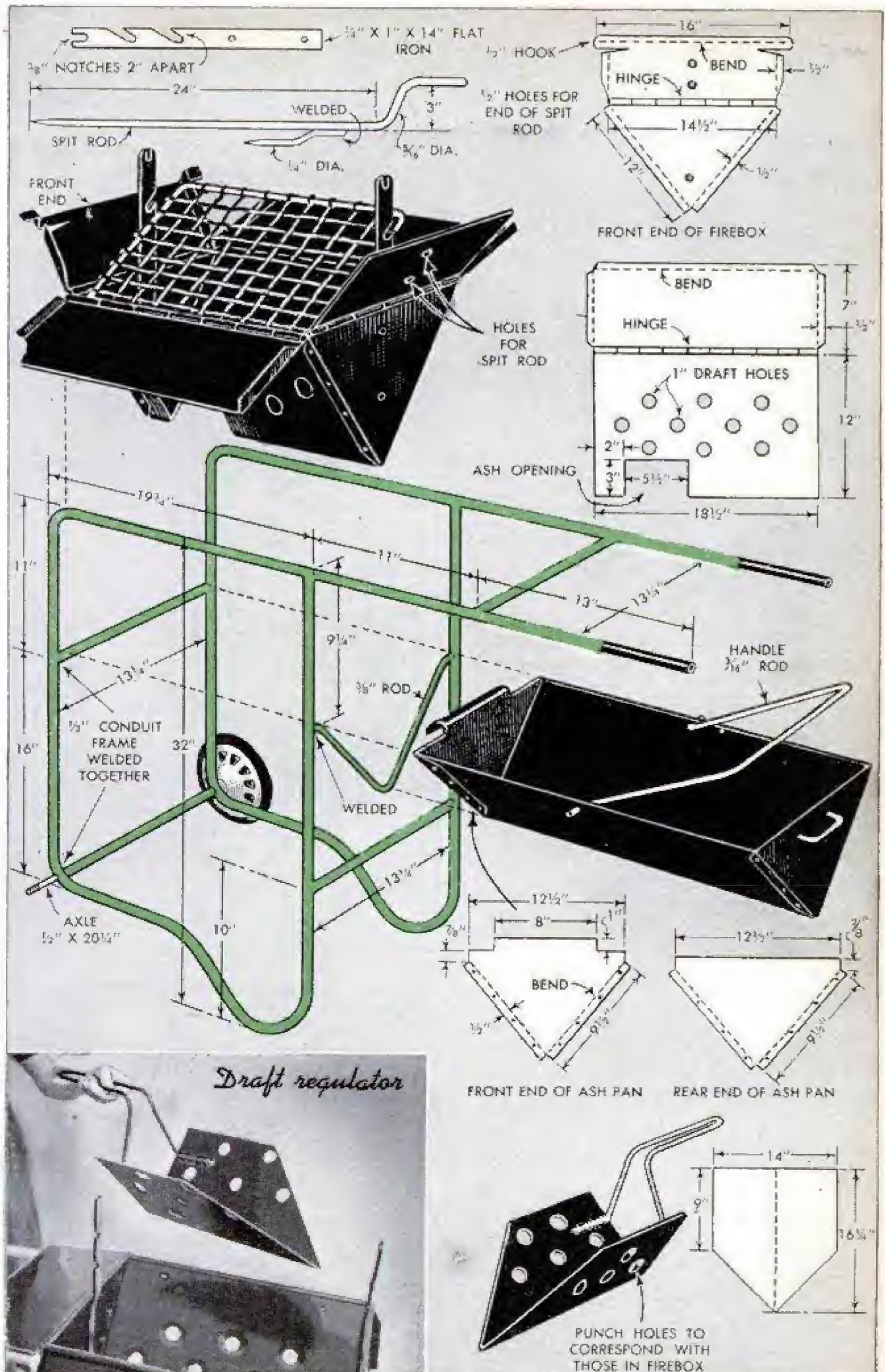
By Benjamin Nielsen

PICNICS where you want 'em — that's the feature of this rolling outdoor grill, for not only can you wheel it to any spot in the back yard, but you can take it with you on camping trips. The frame of the cart is bent cold from rigid electrical conduit, then welded and equipped with rubber-tired coaster-wagon wheels. Both the firebox and ash pan of the original were made from metal salvaged from discarded

auto hoods, making use of the hinged parts to provide folding windshields. However, the firebox can be formed from sheet metal and the windshields hinged with small butt hinges. Note that friction tabs are formed on the front windshield.

Draft holes are punched in the sloping sides of the firebox and corresponding holes are made in a draft regulator which, in use, remains inside the firebox and is shifted back and forth to control the draft. Note also that an opening is made in the bottom of the firebox for dumping the ashes. Ash pan and firebox are riveted together, and two notched posts support a spit at different heights above the coals.





Lawn Roller Helps Control Fire When Burning Weeds or Grass



Spread of the fire when burning off grass or weeds may be checked by means of a heavy lawn roller. If the fire begins to get out of control, just push the roller over the spreading flames and they will be snuffed out effectively.

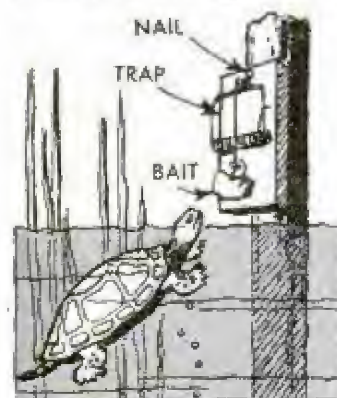
M. K. Voedisch, Rockford, Ill.

Line on Partially Filled Paint Can Shows Color and Amount

The next time you use part of a can of paint—before putting it away—draw a line on the outside with a match stick that has been dipped in the paint to indicate the level of the remaining amount. Then, without removing the lid, you can tell at a glance how much paint there is and also the color of the contents.

William Swallow, New York City.

Turtles Caught With Rattrap

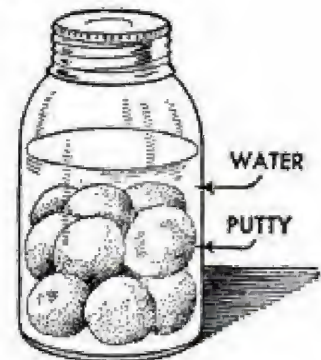


Spring-type rat-traps are an effective means of disposing of turtles which menace game fish in a pond or lake. Set several posts in shallow water near the shore. They should be long enough so

that the tops will project a foot or more above the water. Nail a rattrap to each post with the bait pan at, or slightly above, the water level and bait the traps with raw meat or chicken heads. When a turtle grabs the bait the trap will be sprung.

Putty Kept From Hardening

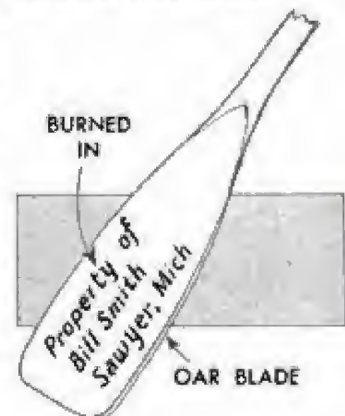
Putty may be kept in workable condition over a period of time by storing it in a water-filled jar. Use a fruit jar with a screw-type lid, and roll the putty into balls small enough to slip through the opening of the jar. The putty should be rolled



in the hand until an oily film forms over the entire surface. Fill the jar half full of water, place the balls of putty in it, and add water until it covers the putty at least 1 in. Then screw the cap on the jar tightly. Shake excess water from the balls of putty before using, or pat dry with a cloth.

Burned-In Name Identifies Oar

To assist in the return of lost or misplaced oars, burn your name and address into the blades. If no regular burning equipment is available, a soldering iron or a length of heated rod will serve for this purpose. Be



sure to cut the letters deep enough so that they cannot be removed by sanding. If you have several boats with different names or numbers, burn this identification into the blades also and it will be easy to match a pair of oars with the boat to which it belongs.

Repairing Broken Battery Post

When a battery terminal post breaks off, a satisfactory repair can be made in the following manner: File the broken post and the terminal on the battery until they are square and butt perfectly. Drill a $\frac{1}{4}$ -in. hole lengthwise through the post and about $\frac{1}{2}$ in. into the terminal. Then tap the hole in the terminal, insert a bolt in the post and screw it in place.

Orville Kellman, Kenosha, Wis.

STEERING GEARS for OUTBOARDS

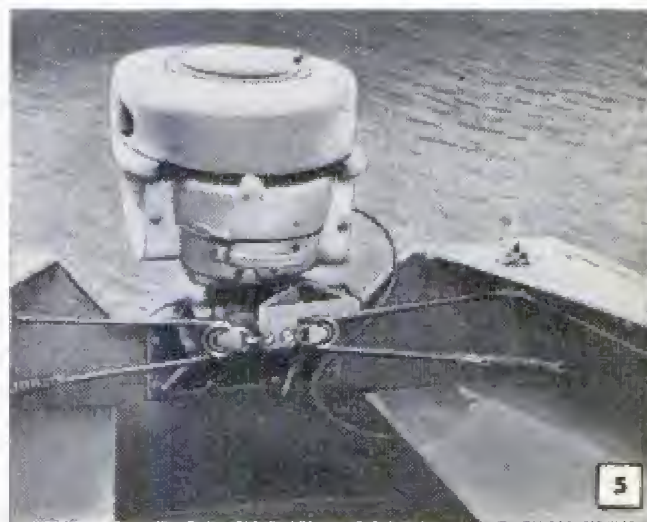
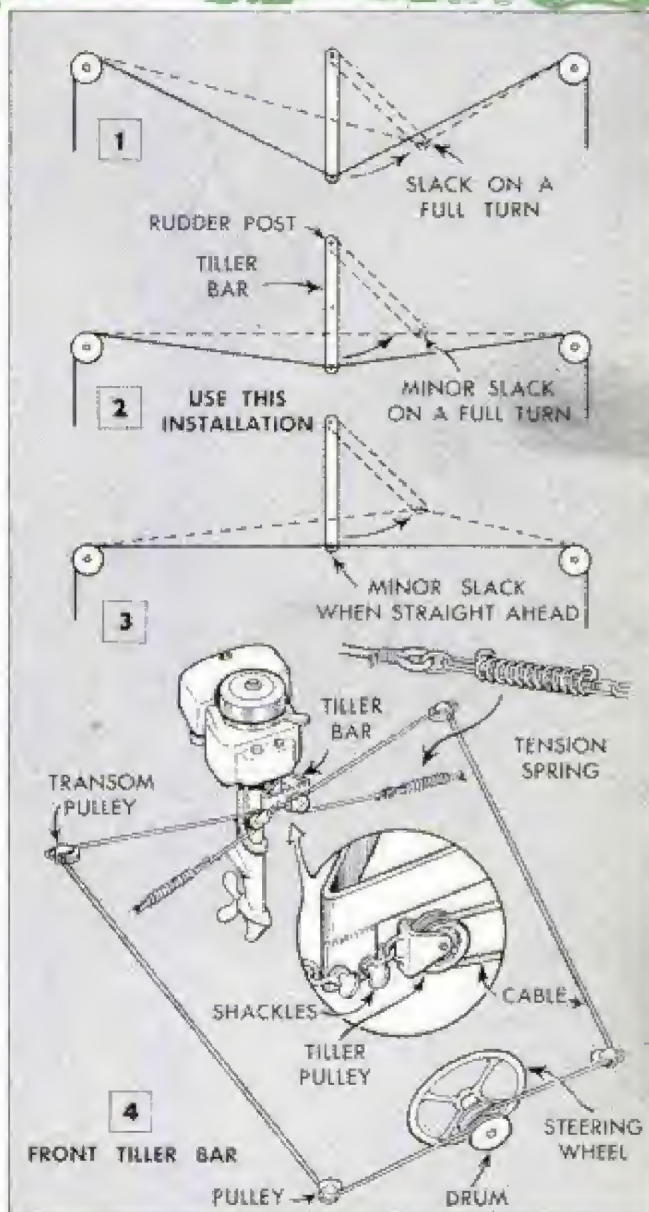


By Thomas E. Riley

CORRECT steering-gear installation in outboard motorboats, especially those in the more powerful runabout classes, is extremely important not only to obtain maximum efficiency from the motor but also to insure the safety of the occupants of the boat. A good steering-gear arrangement should have a minimum of slack in the cables. Slack cables may foul the gear or produce a slow response to the controls, both of which can be hazardous. The system must be smooth and reliable. Any tendency to steer hard in one direction should be reduced, along with the strain of motor torque on the steering gear itself. The arrangement should permit easy attaching and detaching of the motor, allow the motor to tilt readily, and must not interfere with cranking it.

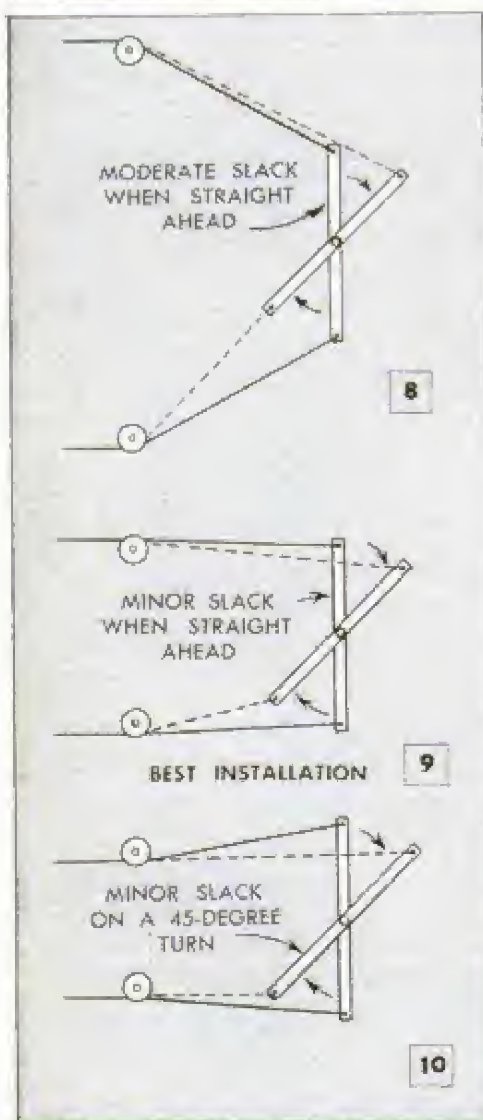
The manufactured auto-type wheel with a grooved aluminum drum and housing is the most suitable steering wheel for a runabout. However, if well constructed, a homemade drum 3 or 4 in. in dia., attached to an auto steering wheel, will operate satisfactorily. A conventional spoked wheel is permissible on a slow outboard cruiser or fishing craft, but one should never be used on a runabout, as the whirling spokes will cause trouble on a fast turn. Both for protection and appearance, the drum and cables should be placed under the dash whenever this can be done. The best cable to use is $\frac{1}{4}$ or $\frac{5}{16}$ -in. bronze-core tiller cable. This type is strong and long lasting, will not shrink or expand, and it will not jam in the pulleys. Brass pulleys, $1\frac{1}{2}$ to 2 in. in dia., are preferred to galvanized ones as they will not rust. However, if galvanized pulleys are used, be sure to oil them occasionally.

Where to attach the pulleys and run the cables, of course, depends entirely on the boat. If possible, run a cable along each side of the boat to eliminate a reverse turn in one of them at the stern. The cables may be attached to the motor either by a bracket mounted on the regular tiller at





Left, method of connecting tiller cable to rear tiller bar. Pulleys are mounted on bar and in transom. Above, tiller bar is fastened under muffler on this motor

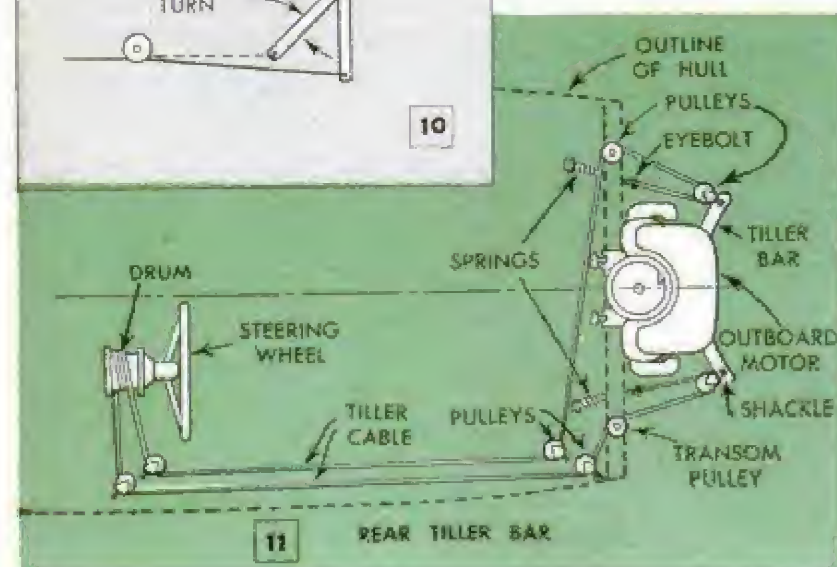


the front, Fig. 5, or on a tiller bar fastened to the rear of the motor so that it projects from both sides. Before deciding which method to use, it is advisable to consider that, if the cables must be placed low along the sides of the boat, the front installation will allow the motor to tilt upward without stretching the cables and pulleys. For the same reason, the rear installation is preferable if the cables are most easily placed higher along the gunwales.

Figs. 1, 2 and 3 show a front tiller bar in straight-ahead and full-turn positions with different pulley locations. Note that the installation in Fig. 2 is the best one to use, as it is a compromise between the leverage and slack factors, giving a fair amount of leverage with a minimum of slack. Figs. 8, 9 and 10 show the effects of different pulley locations using the rear method of connecting the cables to the motor. If you use this method, make the installation similar to that shown in Fig. 9, because it provides good leverage on the tiller bar and a minor amount of slack in the straight-ahead position. If you use the front method of connecting the cables to the motor, the tiller bar should extend an inch or so beyond the joint in the regular steering handle, and the cables should be centered in front of the motor. If the rear method is used, the bar should be mounted low on the motor, as in Fig. 7, and each end of the bar should be bent to the

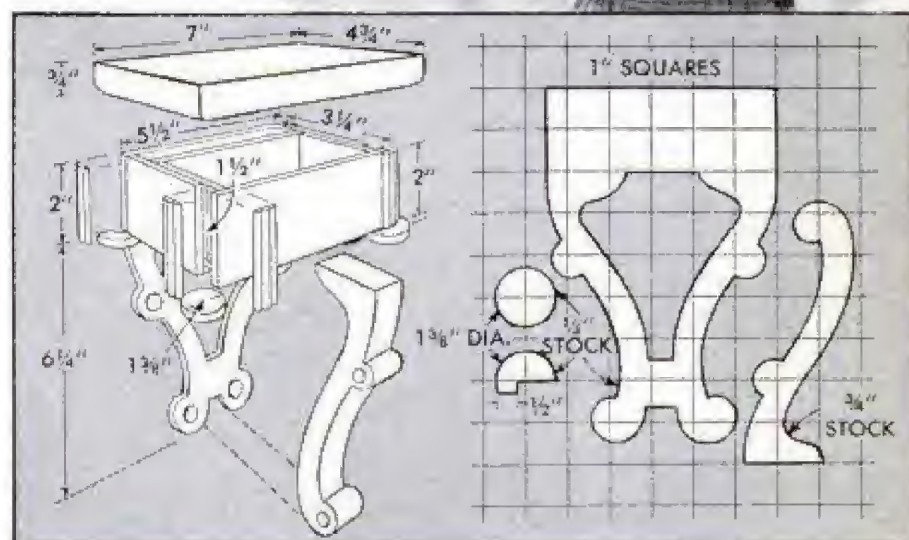
rear, Fig. 6, to prevent the pulleys on the bar from striking the stern of the boat on a turn.

Fig. 4 shows installation of cables, pulleys and tension springs when using the front tiller bar. Fig. 11 shows the installation for the rear tiller bar, running both cables along the port side of the boat. Pulleys are fastened to both types of tiller bar with shackles, as indicated in the circular detail, Fig. 4. The ends of the cables are attached to tension springs anchored to the hull near the transom pulleys or somewhere in line with them to eliminate slack in the cable.



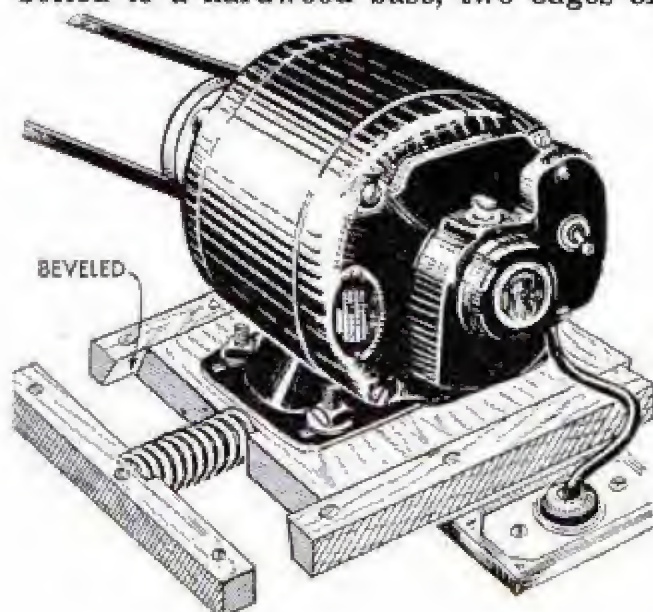
Neat Wall Shelf Has Secret Drawer

Designed to appear as a solid unit, this attractive little wall shelf contains a secret drawer that one would never suspect. Ideal for storing small valuables, the drawer is made inconspicuous by representing the front of the shelf. All the parts except the front leg and the top, which are cut from $\frac{3}{4}$ -in. material, are sawed from $\frac{1}{4}$ -in. stock. The ornamental buttons on the legs may be cut from $\frac{1}{2}$ -in. dowel and glued in place. The drawer is fashioned so that its front overlaps the sides of the box slightly more than the thickness of the wood, to provide clearance for end strips of molding fastened to the corners. If the molding and the $1\frac{3}{8}$ -in. disks are attached to the drawer as indicated, they will convey the impression that the rack is solid.—R. W. Madden, Palatine, Ill.



This Self-Adjusting Motor Mount Gives Constant and Uniform Belt Tension

Ideal for use where one motor is employed to operate several different machines individually, this self-adjusting motor mount is designed to provide constant belt tension without undue strain on both motor and machine bearings. The motor is bolted to a hardwood base, two edges of



which are beveled and a notch cut in the front edge to take the end of a compression spring. The spring is made a permanent part of the motor base by stapling it to the edge. In this way, one spring will do for each setup. Two cleats, each having one edge beveled, are inverted and screwed to the bench top to provide guides for the motor base, as shown. Cleats are adjusted to provide a snug, sliding fit for the base and are located to align the motor pulley. Waxing the edges of the base and cleats gives an easy sliding movement. The stop cleat for the coil spring should be located at a point where minimum tension will prevent belt slippage. After much use, it may be necessary to readjust this cleat to take up slack in the belt, which stretches after prolonged use.—William R. Forder, North Bay, Ont., Can.

¶To assure long life for pillow cases, always select cases that are slightly oversize for the pillow being used. When the pillow is forced into the pillow case, it will wear out sooner.

MODEL YOUR HOME

before you build



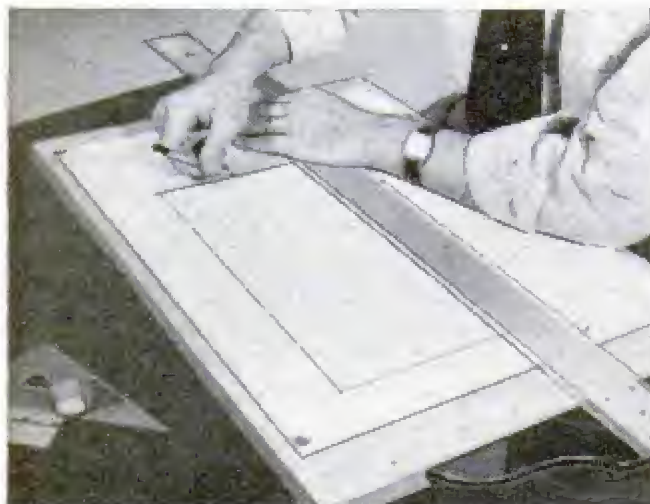
By Richard W. Emery

USING inexpensive materials and the simplest of tools, you can build, in a few hours, a true scale model of that home you have planned. A model of cardboard, even a simple one, not only gives a realistic, three-dimensional view of the home before it is built, but a careful study of the model may save you a lot of money by showing up impractical or costly features before actual construction of the house begins. In a simple floor-plan sketch it may appear that you have all that you desire in convenience and comfort, but a scale model likely will show minor changes, which will make the arrangement even better. On the other hand, it may reveal beforehand structural defects or a faulty room or interior arrangement. With the four walls of a model in place in a scale reduction of a plan, you can determine size, location and number of windows and doors, locate partitions and decide on room sizes and ar-

range easily, because you can see how these details will appear in the full-size structure. It's quite as easy to pick the type of roof, the most advantageous location of the house on the lot and the height of the chimney in relation to the ridge. It's also possible to decide on the smaller exterior details and the color of the paint job as well. All these points should be decided definitely before you build.

To lay out a plan accurately to scale you will need a draftsman's T-square, a 45-deg. triangle, a pair of dividers, a small drawing board, thumbtacks and a triangular scale showing common scale reductions.

Begin by thumbtacking a piece of illustration board to the drawing board. Then, with the scale, lay out the size of the lot, using a scale of $\frac{1}{4}$ in. equals 1 ft. For some types of construction a scale reduction of $\frac{1}{8}$ in. equals 1 ft. is practical. Mark the property boundaries on the board. Then, using the same scale reduction, lay out the floor plan of the house on another sheet of



Lay out the exact scale size of your lot on heavy illustration board and mark boundary lines in pencil. Use the common reduction of $\frac{1}{8}$ or $\frac{1}{4}$ in. to 1 ft.



Cut out the lot, using a metal-edged ruler and a sharp, thin-bladed knife. Hold the blade in a vertical plane so the edges of the board will be square on all sides

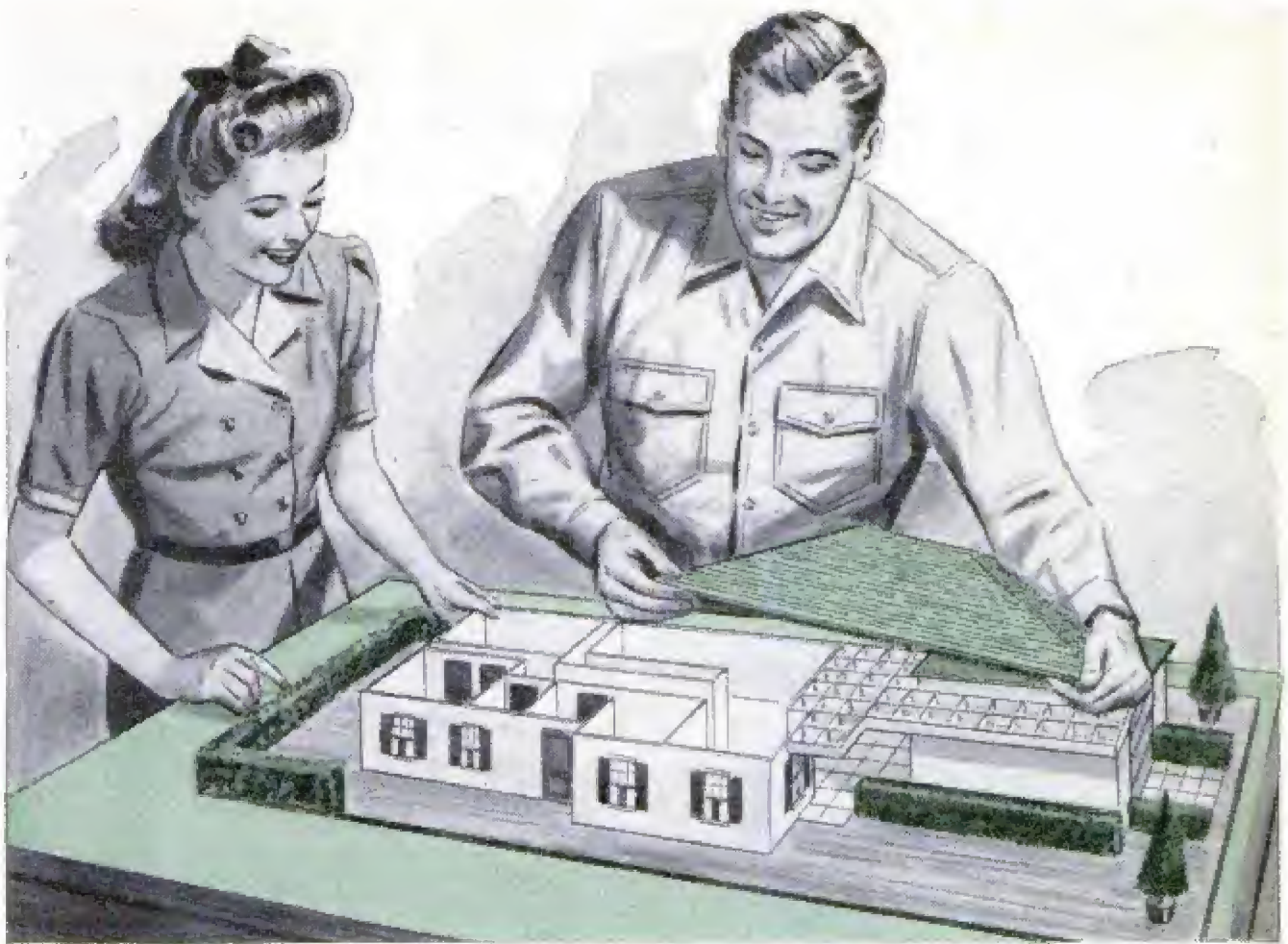
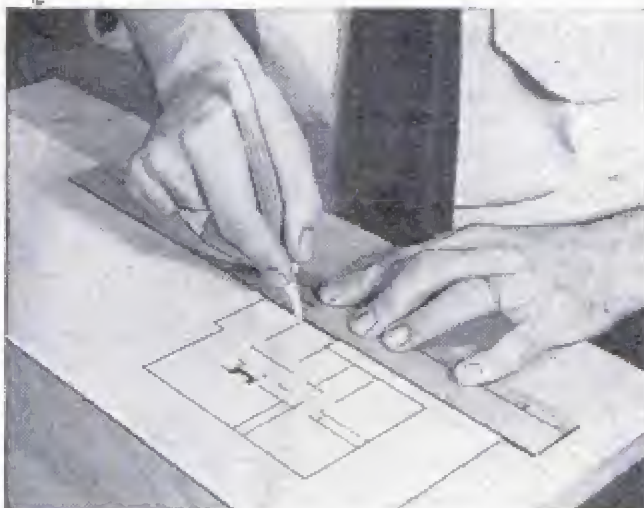
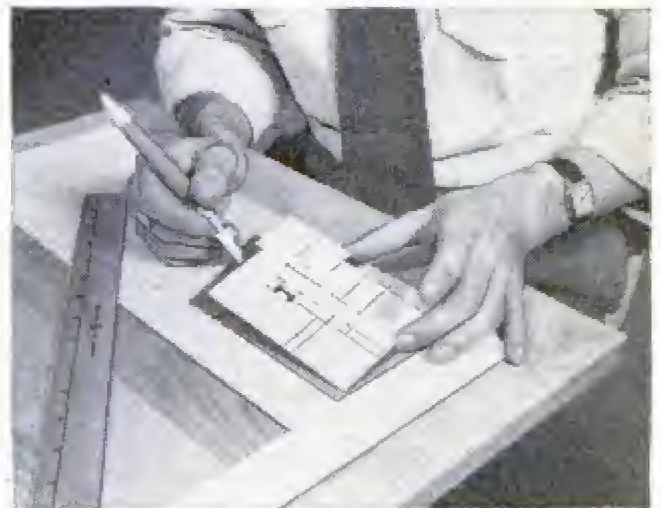


illustration board. Scale the thickness of the walls and mark the inside over-all dimensions of the floor plan. Then cut on the inside lines. Cement this cutout in place on the plan of the lot in exactly the same location as the full-size house is to be. This method of cementing the floor-plan piece to the board on which the lot plan is laid out makes it easier to position the walls. Use your T-square and triangle to get parts laid out exactly at right angles and be careful about the measurements. Lay out the

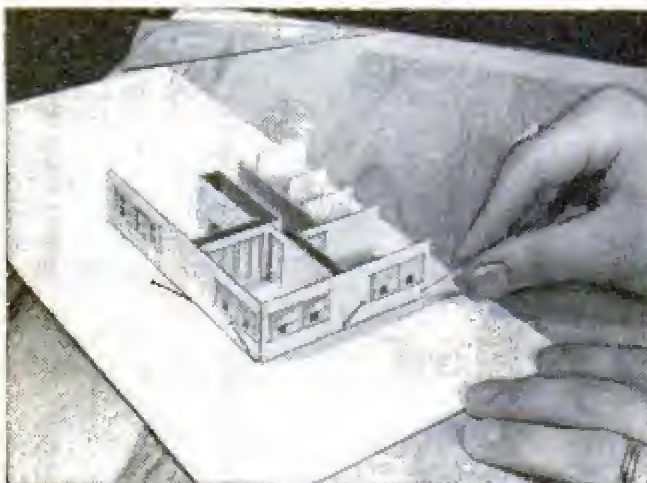
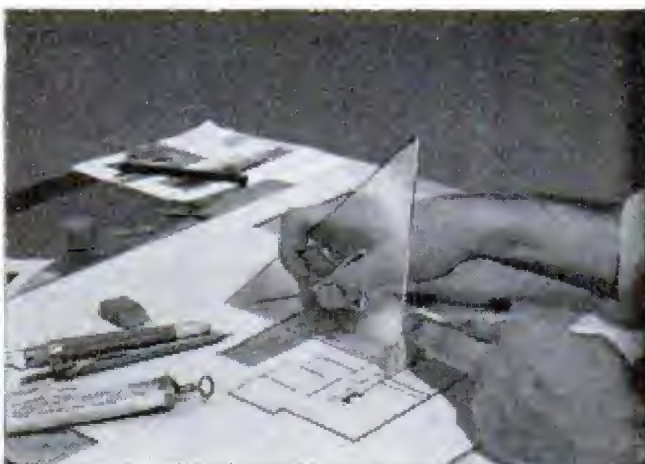
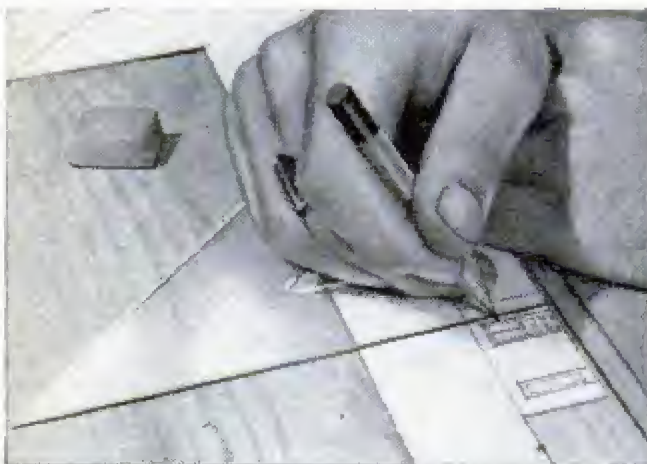
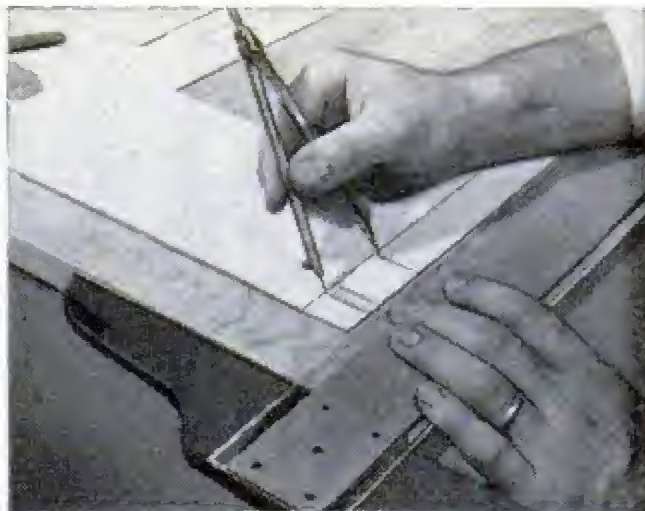
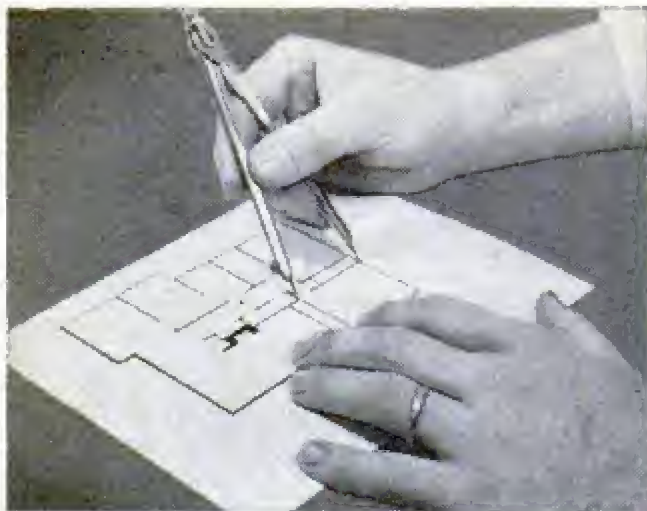
location of the partitions next. Photos on page 186, beginning at the top and reading left to right, show the use of draftsman's dividers in laying off measurements accurately when locating partitions and other plan details. The next two photos left to right, show the house plan being cemented in place on the lot. Use airplane cement for this purpose as it sets quickly and does not discolor. Next, determine the scale height of the outside walls and partitions. Mark off and cut strips of the illustration board



On another board lay out the house plan. Mark the partitions. Plan should be an exact scale reduction of the inside dimensions measured from wall to wall



Then cut out the floor plan on the lines, being very careful to hold the knife perpendicular to the board so the edges of the cutout will be square and smooth

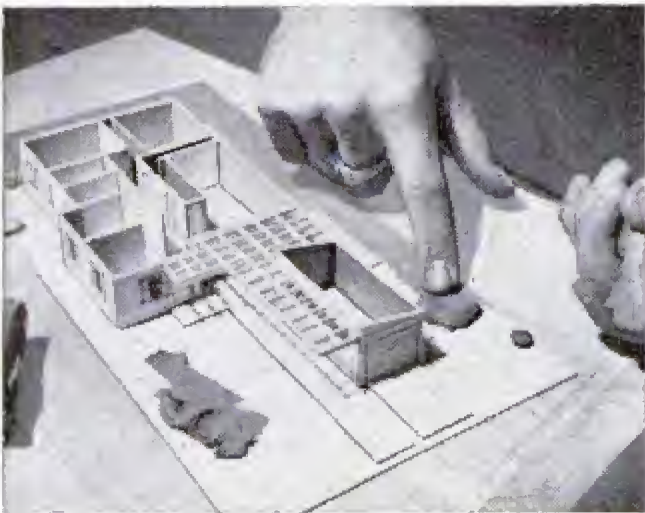




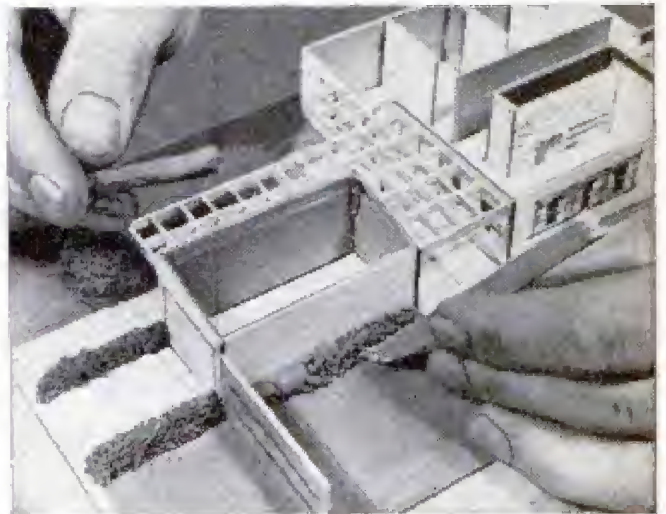
The ceiling and roof are made as a separate unit to lift off, exposing the arrangement of the rooms



A trellis, arbor or fence can be built from strips of pine or balsa wood, cemented together in sections



Colored modeling clay is used to form shrubbery and hedges. Strips cut from a sponge also can be used



Finishing the modeling-clay shrubbery with the splinted end of a stick gives a realistic effect of foliage

so that you can cut pieces of partition and wall stock as required. Remember that the height of the partition strips must allow for the thickness of the cemented floor plan so that outside walls and partitions will be the same height when assembled. Scale-sized windows and doors are represented by drawing the outlines directly on the walls with black ink, or with pencil, as in the left-hand photo, third row, page 186. When setting up partitions and walls, use the triangle as in the right-hand photo, third row, so that when the cement dries the parts will stand true vertically. Hold the outer walls with pins as in the lower left-hand photo. On most plans you can cement all the partitions in place before setting the outside walls. At this stage, with the exterior walls in place, cut a ceiling piece of the exact outside dimensions of the floor plan so that it overlaps the thickness of the walls on all sides. This gives you a foundation on which to build the roof. If the house has a boxed cornice, then the ceiling piece should extend beyond the outer walls a scale distance equal

to the overhang of the cornice. Build the roof in sections as in the lower right-hand photo, page 186, using small blocks of wood to elevate the sections to the correct pitch. Carve the chimney top from a small block of wood to scale size, score it, or line with ink to represent bricks, and cement it to the roof. By this method of construction the roof and ceiling can be lifted off as a unit to show the room interiors.

The garage, sidewalks, service court, yard fences, trellis or pergola, trees, shrubs and the garden are exterior details on which you will have to use your own ingenuity, as the details and plantings will vary with the lot and locality. Hedges and shrubs can be worked out with modeling clay. Artificial trees are available, trellises and fences are easily carved from pine or balsa wood. Build the garage from the house materials and lay out and assemble it in the same way. Paint the model with painter's oil colors thinned with turpentine to an easy brushing consistency. Use soft-bristle brushes to spread the paint in a uniform coating on the small surfaces.

War-Surplus Ship's Bell Serves as Dinner Bell When Mounted on Brackets Near Farmhouse Door



Ship's bells now being sold as war-surplus items make excellent dinner bells for use on the farm. One of these bells can be mounted conveniently on a post outside the farmhouse door by means of a bracket made from flat iron. The side pieces are bent to clear the flared mouth of the bell and holes are drilled in each of them for bolts and stub axles. Short pieces of iron rod brazed to a curved flat-iron cross member serve as the stub axles. Washers provide clearance, and a heavy wire arm is brazed to a piece of rod, drilled and cross-pinned to one of the axles. The bell is attached with a screw inserted through a hole drilled in the top of the cross member.—Hi Sibley, Nuevo, Calif.

Safety Rope Attached to Boat Transom Prevents Losing Outboard Motor

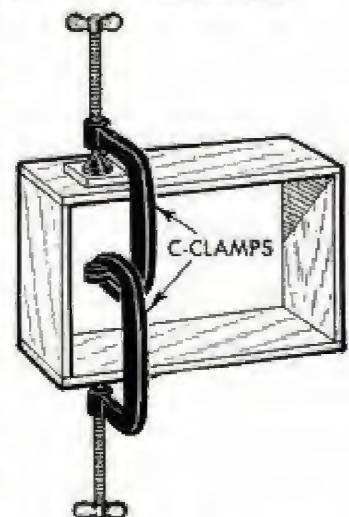
There will be no need to worry about losing an outboard motor in the event it should work loose and fall into deep water, if it is fastened securely to the boat with a length of strong, tarred rope. Turn a large screw eye into the transom of the boat, and tie one end of the rope to the screw eye and the other end to the mounting bracket of the motor. If the motor is a heavy one, use an eyebolt instead of a screw eye in the transom to be sure it will not pull out under the weight of the motor.



To facilitate removal of the motor, the rope can be attached to the screw eye by means of a spring or bolt-type snap hook.

Doubling Use of Small C-Clamps

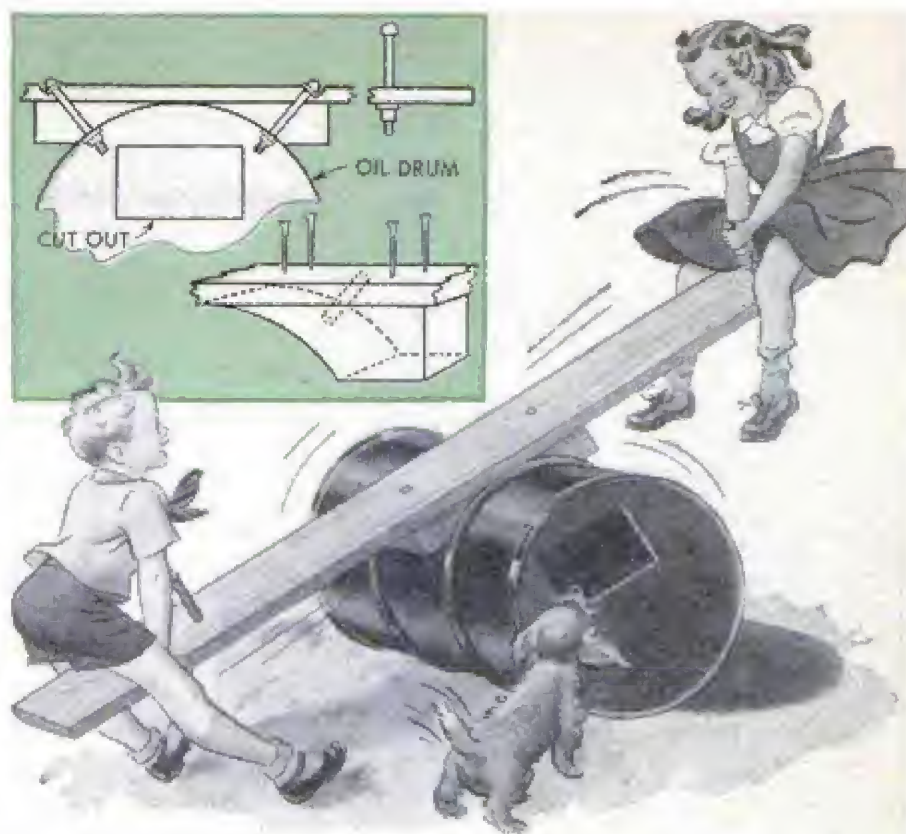
When gluing together the parts of drawers, boxes, etc., and the C-clamps at hand are a little too small to be used singly, simply hook two of them together as shown and use as one clamp. While the two clamps will stay hooked together when they are tightened, they can be temporarily wired together to facilitate applying them singlehandedly. In addition, if a long bar-type clamp is needed for clamping large frames, two C-clamps linked together by a piece of wood which has a hole in each end can be used to improvise a clamp of practically any length.



Thomas B. Owens, Cleveland, Ohio.

Children's Seesaw Utilizes Oil Drum

This portable seesaw, which consists merely of a plank balanced on an empty oil drum, is both inexpensive and easy to build. As the drum is not fastened to the ground, the seesaw may be moved about the yard, or taken into the basement on rainy days. To make it, cut two wooden blocks to fit the curvature of the drum and screw them to the plank. Then bolt the plank and blocks to the drum, first cutting a hole in one end of the drum to allow tightening the bolts from the inside. If you wish, place a handhold near each end of the seesaw plank. Although a suitable handhold can be made by driving a piece of broomstick into an undersize hole, a T-shaped handhold, which is much safer, may be fashioned from pipe fittings, using a short nipple and tee for the vertical member. This is screwed into a pipe



flange attached to the plank. Pipe nipples turned into the tee at the top of the pipe serve as handles. Be sure there are no sharp corners or projections that could cause possible injury.

E. W. Moses, Jr., Blacksburg, Va.



Pulley Reduces Bending Of Pruning Pole

By equipping a pruning pole with a pulley and running the pull rope as shown, undue bending of a lightweight pole is reduced and leverage is greatly increased. The pulley is attached to the arm of the cutting head. Then the rope is passed through it and fastened to a screw eye located on the pole about a foot or so from the top. Due to the increased leverage, care must be used not to bend the cutting head.

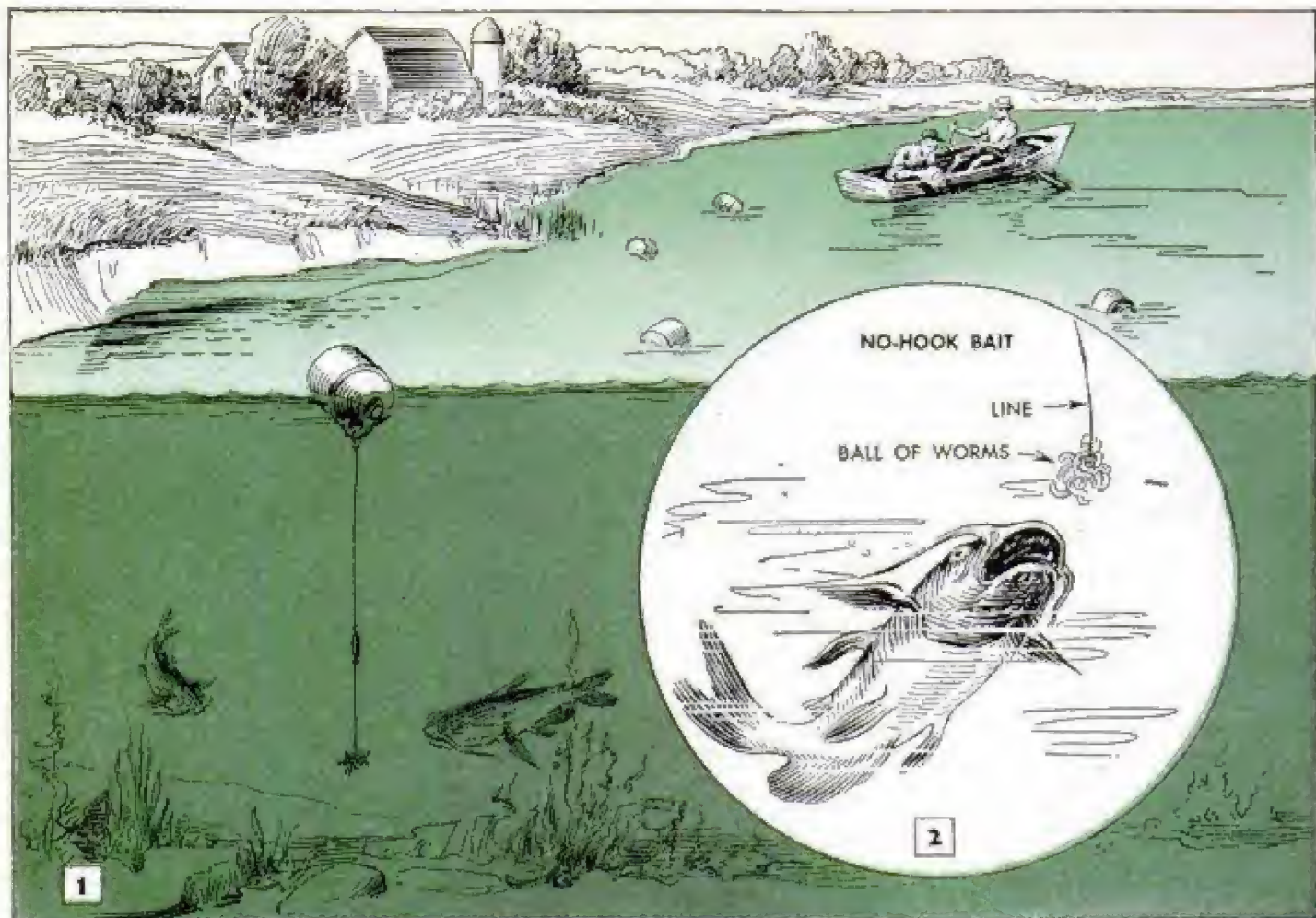
L. T. Bruhnke, Wauwatosa, Wis.

Attracting Birds to New Houses

To interest prospective feathered tenants in a new birdhouse, decorate the entrance and perch with several tufts of grass and a few bits of down. Sight of the grass and feathers will induce the birds to nest. If the house has been painted, let it dry out for several days before erecting.

Dale Van Horn, Lincoln, Nebr.

¶ You can save time in seasoning food and do it more satisfactorily by preparing a mixture of salt, 6 parts, and pepper, 1 part, which can be kept on hand in a shaker ready for immediate use.



OUTSMARTING THE CATFISH

CATCHING bullheads and channel "cats" calls for more than one trick in the bag. The secrets are in the careful preparation of special baits and the methods of fishing catfish waters effectively.

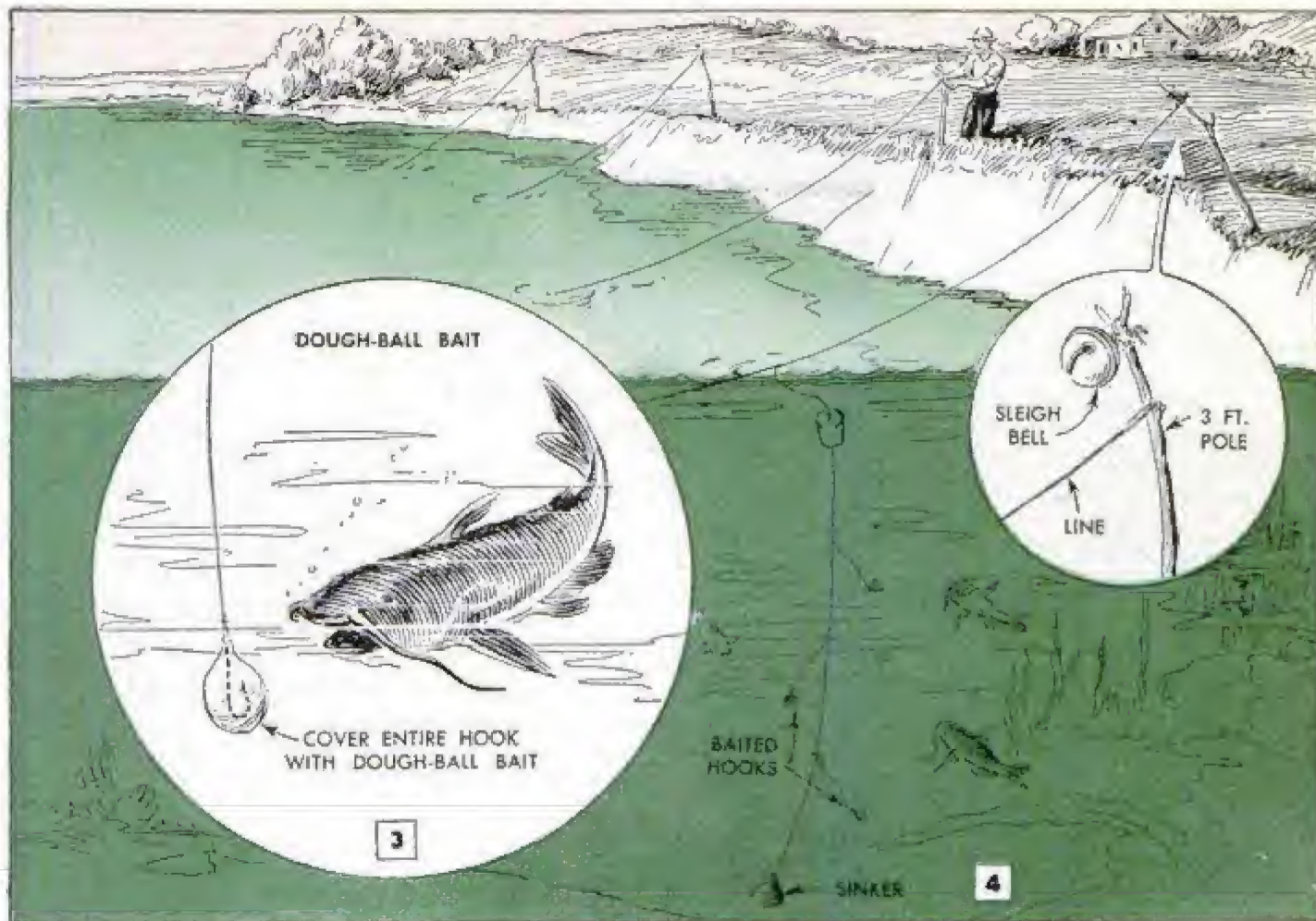
Jugging for catfish: Tie a 36-in. length of line to the handle of a half-gallon glass or earthenware jug. Attach a sinker, a 12-in. wire leader and a hook baited with earthworms. Any number of jugs can be used. Set the jugs adrift to float downstream with the current so that they will be carried over any likely spots, Fig. 1. When fishing a lake or pond in this manner, set the jugs adrift so that offshore winds will carry them slowly across to the other side and follow the floating jugs closely in a boat.

Hookless bullhead bait: Tie several large earthworms with thread to the end of a line long enough to reach near the bottom of the stream or pond, Fig. 2. If in a stream, and the current is rather swift, use a sinker sufficiently heavy to carry the line to the bottom. No hook is used, but any fish taking the bait can be pulled gently within reach of a landing net.

Dough-ball bait: These are made by mix-

By R. A. Jenkins

ing equal parts of white flour and cornmeal, or cottonseed meal, with sufficient water to make a rubbery dough when kneaded. Shape the dough into balls about $\frac{3}{4}$ to 1 in. in dia. and drop them into boiling water. Keep the dough balls moving in the water so that they do not stick together or scorch. When they float to the top, remove them immediately with a spoon and allow to drain. After the baits have cooled, pack them in fruit jars and seal to prevent drying out. In fishing for cats use hooks with a short shank, No. 2-0 to 4-0 size, depending on the size of the fish you expect to catch. If you work carefully when baiting, the dough ball can be made to cover the hook entirely, leaving only the eye and the line exposed. This is the trick in taking the wary channel cat with dough-ball baits. These baits may be fished from the bank of a stream or from the shore of a pond, using a bamboo pole and line long enough to get the bait well out from shore. As a rule, channel cats will be taken in comparatively quiet water, in eddies and backwaters especially, but often they are caught in mid-channel where the current is quite strong. Here you will need a heavy sinker to carry the



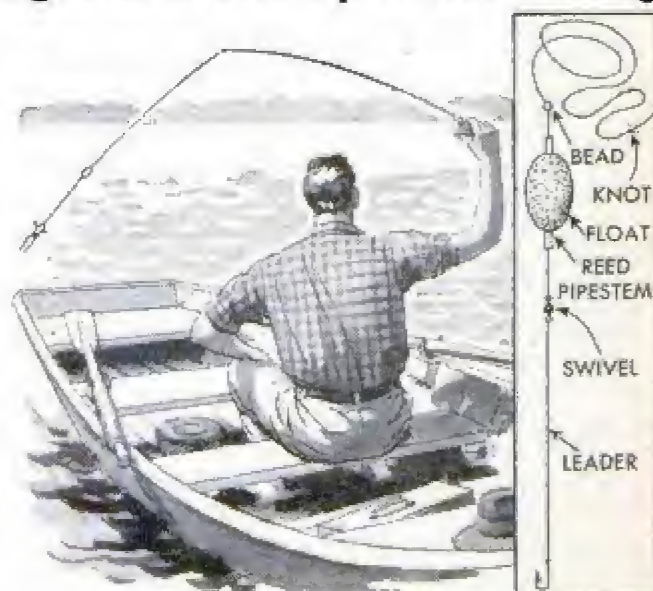
line well down against the pull of the current. Ordinarily the dough-ball bait should be fished deep.

Catfish set line: A good set-line rig for fishing deep water off a dirt bank is shown in Fig. 4. The throw lines should be long enough to reach out from 15 to 30 ft. from the bank. To work this rig at full effectiveness you should know the approximate depth of the water where you are going to set the lines. Attach a heavy sinker to the end of the line. Then attach hooks and

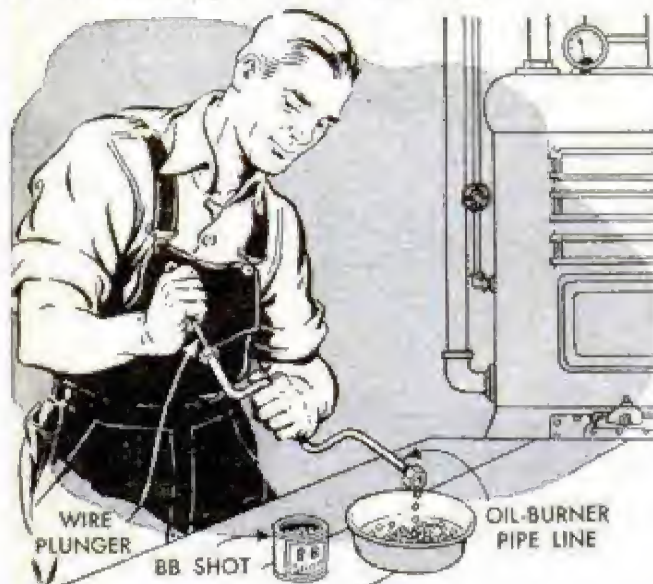
leaders to the line above the sinker as shown in Fig. 4. Bait with dough balls or earthworms. Attach a large cork float to the line at a distance above the sinker which is about equal to the depth of the water. This arrangement will hold the line vertically and fairly taut. Attach the free ends of the lines to short poles driven into the bank along the edge, and tie a sleigh bell to each pole. Before jugging or using set lines, check your state laws governing methods of taking game fish.

Self-Adjusting Float Permits Reeling Bait to Rod Tip When Casting

Difficulty experienced in casting when using a fishing float is avoided with this self-adjusting one, which permits the bait to be reeled to the rod tip. When cast, the float automatically adjusts the bait to a predetermined depth. To make this float, glue a reed pipestem in a hole through the center of a piece of cork. String a small bead on the line, run the line through the pipestem and attach the swivel sinker and leader. Then knot the line above the bead at a point that will allow the hook to sink to the desired depth. The swivel will stop the float from sliding down onto the leader when casting, and the bead-and-knot combination will prevent the line from running out past the setting. Tie a small knot that will not snag in the rod guides.



BB Shot Used to Force Dirt From Kinked Fuel-Oil Line

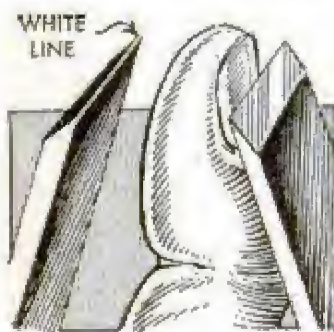


Until I hit upon the idea of using BB shot, I was at a loss to find a way to remove dirt and lint from the fuel line of my oil burner. Usually, all that is required is to run a wire through the line, but in my case, the fuel line had several sharp bends around which the wire would not pass. I solved the problem by pouring BB shot into the tubing until nearly full and tamping it down with a short length of wire until the shot gradually was forced through the obstruction. Be sure to use shot of a size that will roll freely through the tubing.

G. E. Hendrickson, Argyle, Wis.

Easy Tests for Dull Tool Blades

Because dull blades of wood chisels and knives produce inaccurate and slipshod work, it is wise to test the edges of the blades for sharpness before using. One way to do this is to note if a white line is visible along the cutting edge. If so, the blade is dull. Another way is to run the cutting edge of the blade upward on the thumbnail as shown. If the edge slides on the thumbnail without catching, the tool needs sharpening.—J. Modroch, Danbury, Conn.



Cleaning Silicon-Carbide Stones

Silicon-carbide stones used for sharpening knives and axes will, after repeated use, become clogged with oil and dirt to the extent that the surface is glazed and

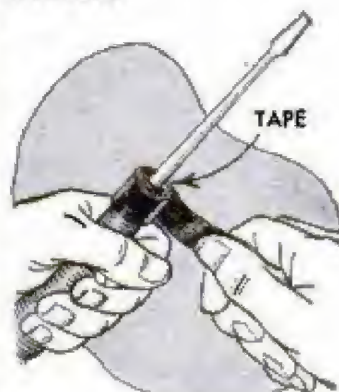
ineffective as a sharpening agent. The stone can be restored to its original condition by heating it sufficiently to burn off the accumulated oil and dirt.

D. E. Horn, River Forest, Ill.

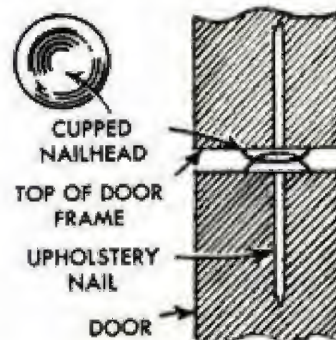
Electrician's Tape Kept Available On Screwdriver Handle

To save time and inconvenience when an occasional small piece of tape is needed, one electrician keeps several turns of tape wrapped around the handle of his screwdriver. In addition to keeping the tape at hand, this method also adds to the gripping surface of the handle.

P. R. Wilson, Brooklin, Ont., Can.



Substitute Friction Catch

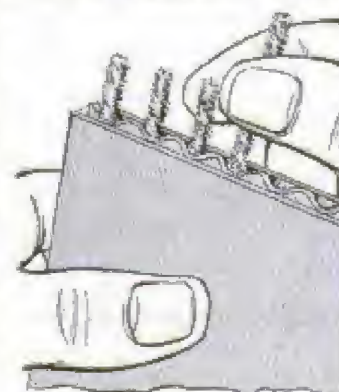


If there is a faulty catch on one of your cupboard or cabinet doors, it can be replaced with a friction catch made from two upholsterer's nails. Drive one of the nails into the edge of the door where

you wish to locate the catch, and drive the other nail into the frame directly opposite the first one. Then, with a ball-peen hammer, cup the nail driven into the frame.

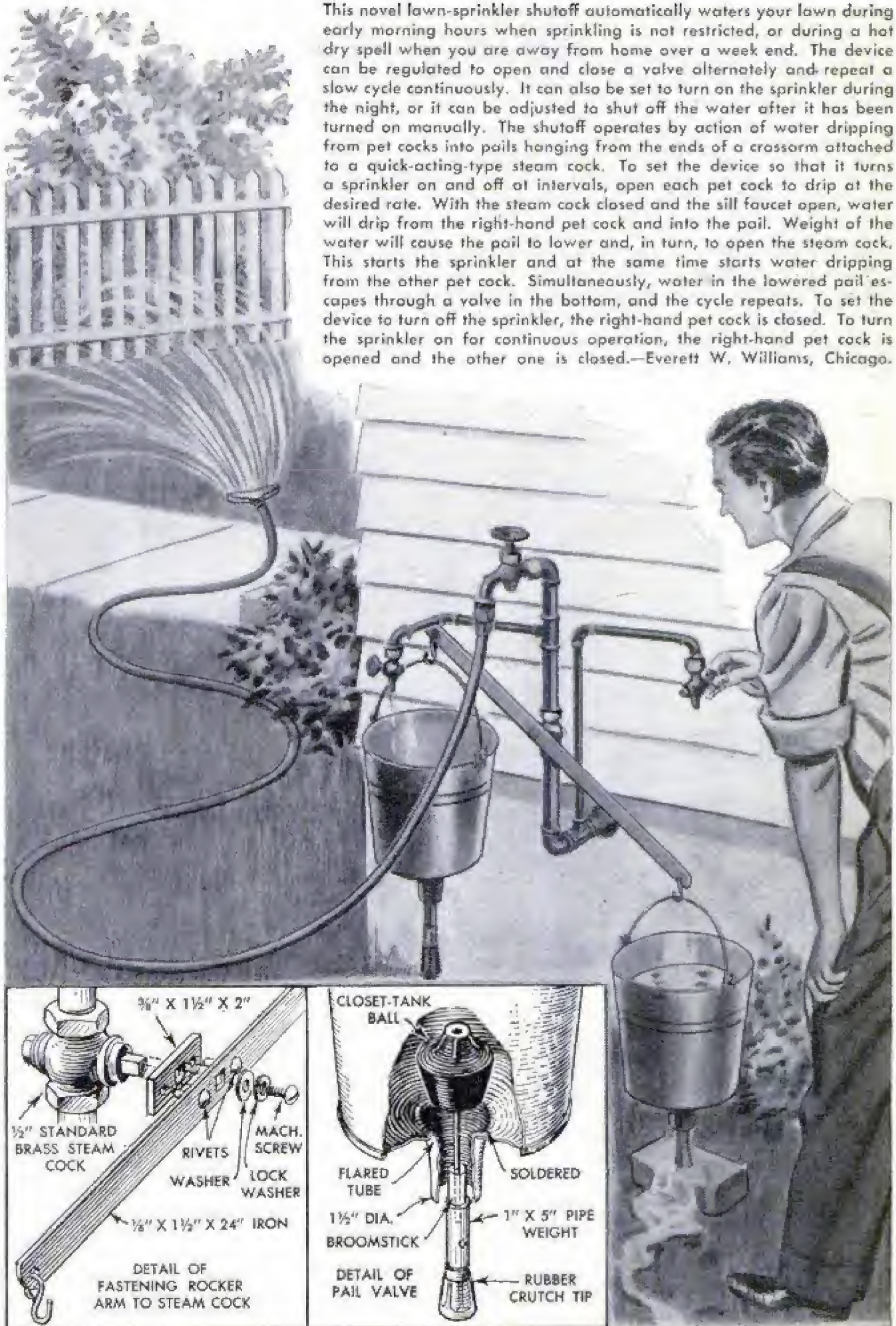
Cardboard Pipe-Cleaner Holder Protects Pocket Lining

The wire centers of pipestem cleaners carried loosely in a pocket may eventually tear the lining. To avoid this, insert the cleaners in a piece of corrugated cardboard cut a little shorter than the length of the cleaners and trimmed to fit the pocket snugly. In addition to protecting the lining from wear, the holder will save the lining from being soiled.



LAWN-SPRINKLER SHUTOFF

This novel lawn-sprinkler shutoff automatically waters your lawn during early morning hours when sprinkling is not restricted, or during a hot dry spell when you are away from home over a week end. The device can be regulated to open and close a valve alternately and repeat a slow cycle continuously. It can also be set to turn on the sprinkler during the night, or it can be adjusted to shut off the water after it has been turned on manually. The shutoff operates by action of water dripping from pet cocks into pails hanging from the ends of a crossarm attached to a quick-acting-type steam cock. To set the device so that it turns a sprinkler on and off at intervals, open each pet cock to drip at the desired rate. With the steam cock closed and the sill faucet open, water will drip from the right-hand pet cock and into the pail. Weight of the water will cause the pail to lower and, in turn, to open the steam cock. This starts the sprinkler and at the same time starts water dripping from the other pet cock. Simultaneously, water in the lowered pail escapes through a valve in the bottom, and the cycle repeats. To set the device to turn off the sprinkler, the right-hand pet cock is closed. To turn the sprinkler on for continuous operation, the right-hand pet cock is opened and the other one is closed.—Everett W. Williams, Chicago.



PHOTOGRAPH YOUR



By Paul Hadley

PHOTOGRAPHING flowers requires careful camera technique. Figs. 1 to 8 inclusive show prints that result from studied selection of the background. For example, to get depth you can use a large cloud print as in Fig. 2. The photo taken with this setup is shown in Fig. 3. Although the cloud detail is greatly subdued it gives sharper definition. The bouquet setup in Fig. 7 was purposely arranged to give out-of-focus background detail and a natural side lighting from sunlight. For average work on single blossoms and small clusters, such as those in Figs. 4, 5, 6 and 8, use plain cardboard backgrounds colored black, white and a neutral gray or brown. Use a camera with a double-extension bellows. Usually a medium-speed "pan" film gives best results, and a light-yellow filter gives a better rendering of the color values on black-and-white film. Large bouquets, like that in Fig. 1, should be arranged so that all the blooms are as nearly as possible in a plane parallel with the film. In this way each of the flower clusters will be within the area of sharp focus.

FAVORITE FLOWERS



A cloud background gives blossoms individuality and at the same time a feeling of depth and naturalness. Photo was taken with the setup shown in Fig. 2



As a rule, large blossoms with brightly colored petals photograph best against a medium-dark background. Flowers should not be grouped in large bouquets



Above and below, two ways of photographing blossoms that flower in clusters where foliage must be included. Shoot close-up, as above, or arrange an open bouquet with subdued background detail (below)



Above, notice how back lighting is used to outline detail in the blossoms and stems. Dark background "hardens" the outlines. Below, careful lighting renders fine detail, but be sure there are no shadows



Portable Trellis on Weighted Bases Easily Moved Into Sun or Shade



Here's a portable trellis that has a distinct advantage over a fixed one in that it can be moved easily to meet the sun or shade requirements of any particular plant. If you wish to grow a certain ivy or climbing rose which must have shade, it's a simple matter to set up the trellis in a shaded spot and vice versa for plants requiring sun. Concrete blocks set on top of the ground are cast around pipe sockets in which the uprights are inserted. If cylindrical-shaped concrete blocks are used, they may be rolled from place to place in the yard.—Opie Read, Jr., Chicago.

Shrinking Model-Airplane Paper

One model-airplane builder found that throat swabs are handy for applying water to shrink the paper covering on wings and fuselage surfaces. However, any similar stick can be used if one end is wrapped with cotton. The swab spreads the water evenly and prevents tearing the paper.

"Pin Up" Candlestick



When the lights fail, or where electricity is not available, here's a handy candlestick that can be stuck to a wall right where you want it when making emergency plumbing or electrical repairs in a basement. It consists

of a rubber suction cup attached to a rubber crutch tip. Use a suction cup which has a machine screw embedded in it and fasten it to the crutch tip by inserting the screw through a hole and tightening a nut on the inside. The suction cup should be a size that will hold the candle far enough from the wall to prevent the flame from scorching paint. Wetting the suction cup will help to make it adhere.

Herman Klein, Pittsburgh, Pa.

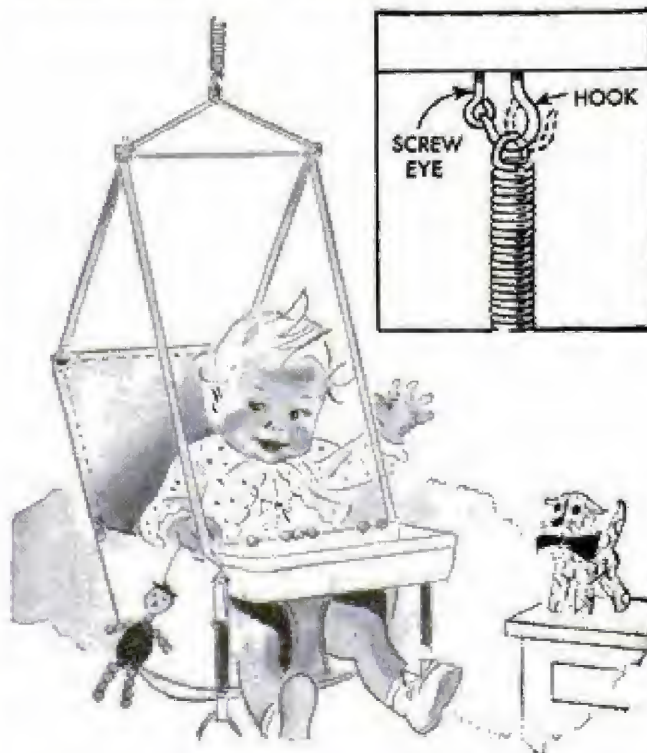
Luminous Paint Applied to Flashlight Aids Finding It in Dark

Much time can be saved and trouble avoided when trying to find a flashlight in the dark, if luminous paint has been applied to the rim of the flashlight-lens holder. Most paint of this type will retain its luminosity for a considerable length of time. A small artist's brush may be used to apply the paint to the rim.



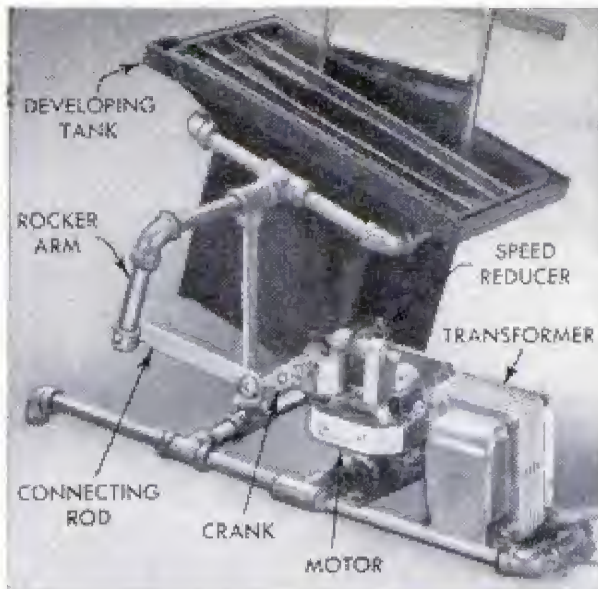
Safety-First for Baby's Swing

Eliminate the possibility of the baby's swing jumping off the hook from which it is suspended by placing a screw eye at

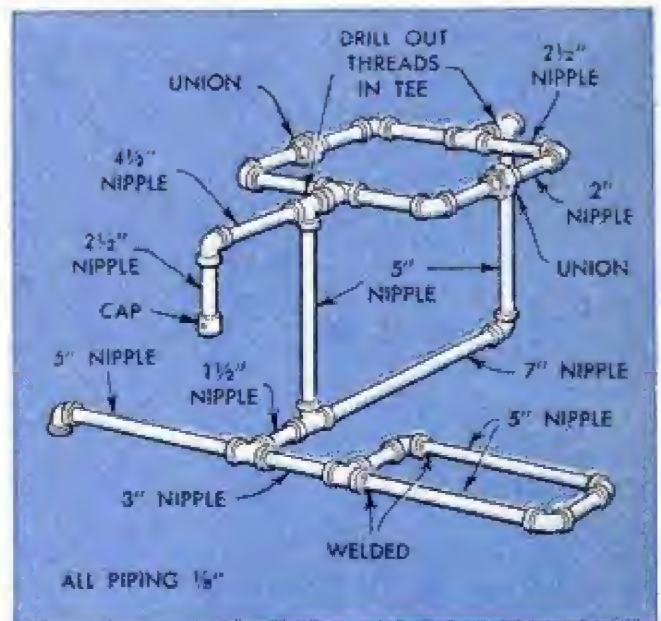


the end of the hook as shown. This arrangement will prevent the loop at the end of the spring from becoming disengaged. To remove the swing, merely turn the hook away from the screw eye.

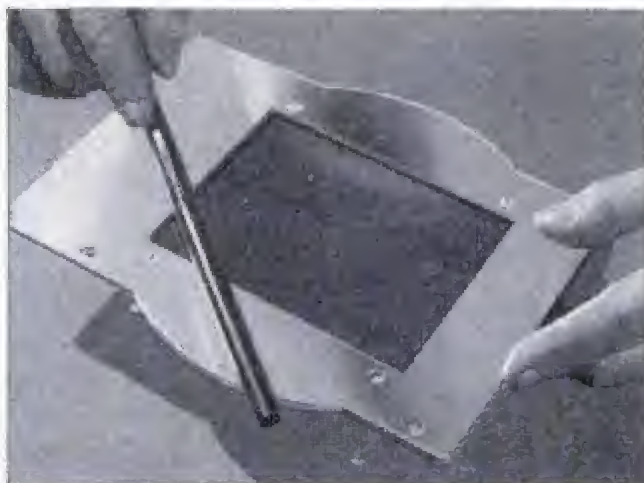
Film-Tank Agitator of Pipe Is Motor Driven



Made entirely from standard pipe nipples and fittings, this film-tank agitator is operated by a speed reducer coupled to a small 6-volt electric motor and transformer. The speed reducer (60 r.p.m.) and motor, which are available at electrical stores, actuate the film-tank cradle by a flat-iron connecting rod. Although designed for a standard cut-film tank, the unit also will accommodate a roll-film tank if a circular opening is cut in a piece of plywood for the tank which then is placed on top of the cradle. Reamed pipe tees form bearings or pivot points for the shafts of the cradle, the latter being assembled in one piece by means of two unions. The shaft to which the rocker arm is fastened is attached after the cradle is in position. Note that the base of the agitator requires soldering or welding two of the connections; otherwise all pipe parts merely are threaded into one another. The transformer and motor are anchored to the frame with machine screws.—Del Naylor, Chicago.



Static Electricity Better Than Brush to Remove Dust From Negatives



When dusting a negative before making an enlargement, a small brush is sometimes used which merely spreads the dust around instead of removing it. However, if a hard-rubber rod or a comb is charged with static electricity by rubbing it briskly on woolen clothing, and then passed over the negative, it will pick up the particles of dust, leaving the surface clean.

¶If for any reason regular lens-cleaning tissues are not available, the soft filter paper that is used in glass coffee makers provides a good substitute. This paper is sold in most grocery stores.

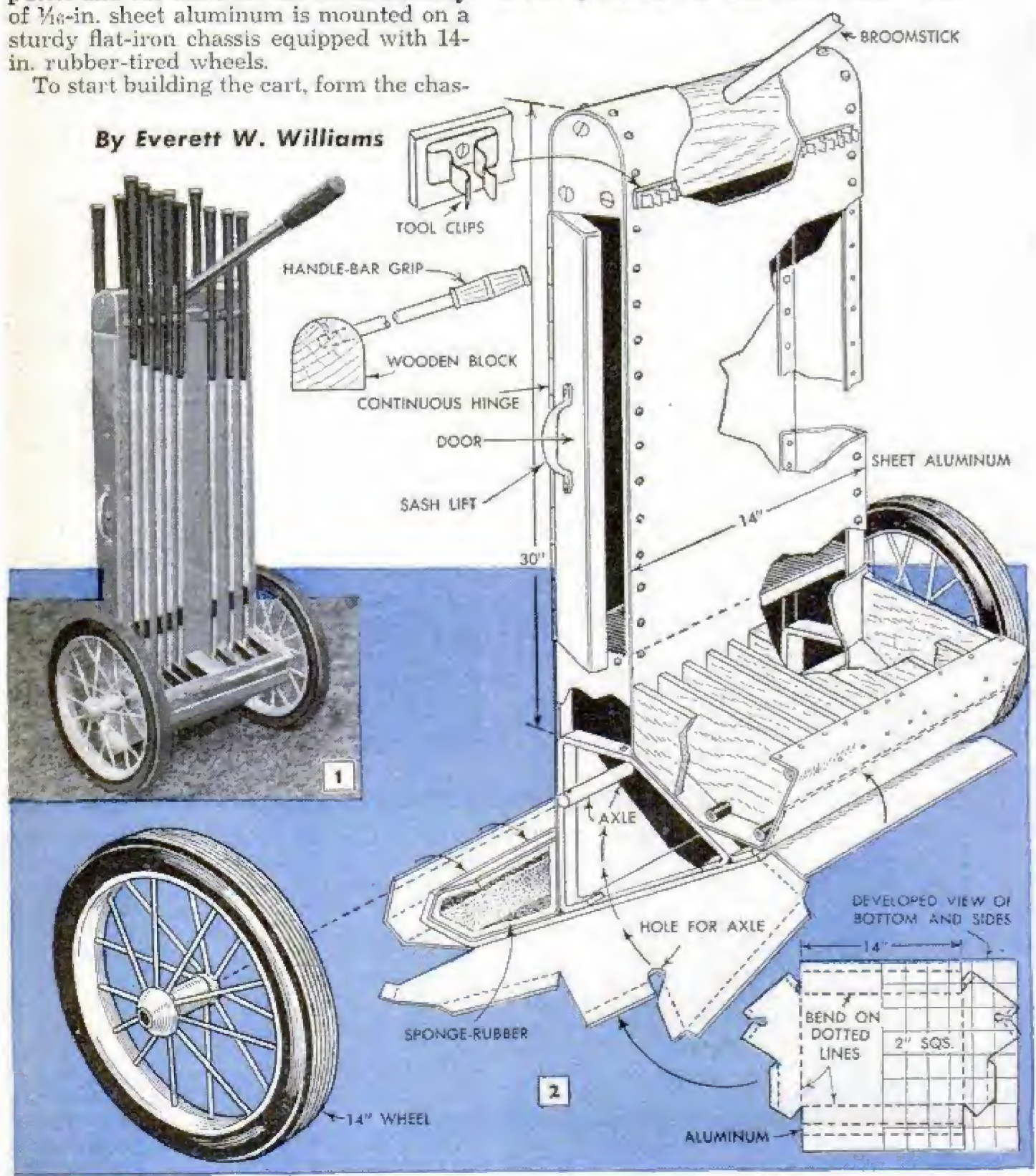
IT'S FOR GOLFERS ONLY

DIFFERING from the usual caddie cart which carries the golf clubs in a bag, this one carries them handle-end up, Fig. 1, for easy and quick selection. In addition, the cart has a built-in locker for storing golf balls, shoes, etc., and a protective cover which can be provided for the clubs in case you are caught in the rain. The cart has two club racks, one for the woods and putter and the other for the irons. Its body of $\frac{1}{16}$ -in. sheet aluminum is mounted on a sturdy flat-iron chassis equipped with 14-in. rubber-tired wheels.

To start building the cart, form the chas-

sis from flat iron, Fig. 3. Two flat-iron braces, 14 in. long, and an axle are bolted crosswise to the side members. The sheet aluminum covering the bottom and sides of the chassis is cut in one piece, following the squared pattern in Fig. 2. Rivet this piece to the underside of the chassis, but do not bend up the flaps. Bend the body next, rounding the top and shaping the lower portions for the club racks. The

By Everett W. Williams



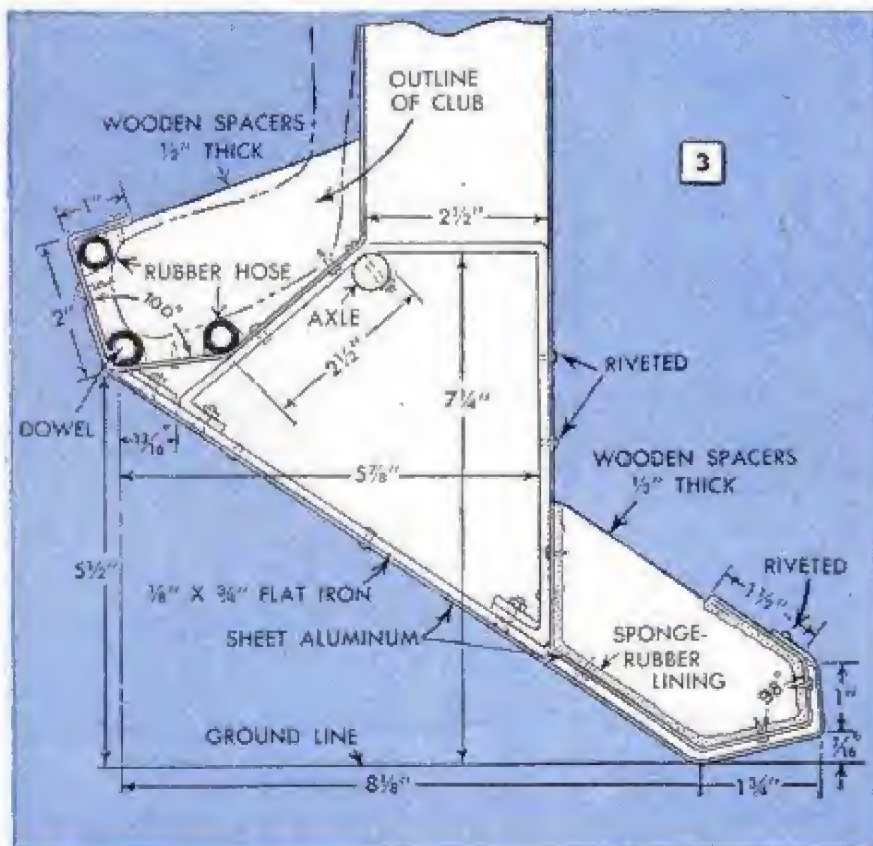
wooden block at the top of the body and all the club-rack spacers, except those on the outside edges, must be screwed in place at this time. Note that the center spacer in the front rack is thicker than the others to compensate for the width of the handle. Before inserting the club spacers, make bumpers for the front rack, Fig. 3, by pushing lengths of dowel inside $\frac{1}{4}$ -in. hose. The spacers are notched to hold the bumpers in place. Reinforce the sides of the body along the locker door with pieces of flat iron extending from the top of the chassis to the underside of the wooden block. The support along the front wall is riveted from the bottom of the block to the locker-floor line. The locker door is fashioned from a piece of aluminum by bending the edges square and aluminum-soldering or riveting the corners. After attaching the door to a continuous hinge, rivet together the hinge leaf, the flat-iron support and the rear wall of the body all at one time, but do not rivet below the locker-floor line.



Now, form a long, channel-shaped piece of aluminum to enclose the opposite side of the body. A tab to cover the end of the body block, similar to the one at the opposite end, is included at the top of this piece. When riveting the channel in place, allow for inserting side-flap tabs later.

When the body is completed this far, rivet it to the chassis. Then bend the side and end flaps, install the outer spacer blocks and fasten the flaps and tabs with screws and rivets. Fit a wooden floor in the locker, fastening it with roundheaded screws, and rivet a small aluminum panel below the locker door. Sponge-rubber padding is glued between the spacers of the rear club rack. Drill a hole in the top of the unit for the broomstick handle, which is anchored with a countersunk flat-headed screw. The end of the broomstick is fitted with a bicycle handle-bar grip. Tool clips are screwed to the body block to hold the golf-club handles.

Aluminum rivets and cadmium-coated bolts and screws should be used throughout, or if metal screws are used instead of rivets, these also should be cadmium coated.



Fishline Can Be Dried on Rod With Clothespin Reel



For convenience, it's hard to beat this method of drying a fishline. All that's needed are two spring-type clothespins, which are clipped to the rod several feet apart so the line can be wound over them as it is unreeled.

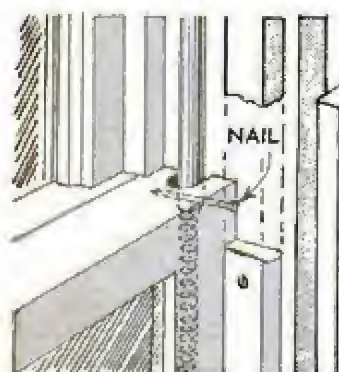
Keeping Crawfish in Warm Weather



In warm or hot weather, it's easy to keep crawfish alive in this improvised "ice-box." One fisherman uses a pail, packs the bottom with ice, and then covers it with screen wire and a layer of grass. The crawfish are

placed on top of the grass and, in turn, are covered with several thicknesses of newspaper and a wet burlap sack. This will keep them lively for some time.

Nail Rides Coil Window Balance To Take Up Side Play



If window sash are grooved too deeply when cutting a track in the edge for a spring-type sash balance, you can take up the play of the balance in the groove by driving a nail crosswise

through the lower sash as shown. The nail is located to ride freely against the tubular casing of the balance when the sash is raised and lowered. It prevents the end of the tubing from digging into the sash and making it difficult to raise. Remove the window stop, and with the sash in a closed position, drive the nail only part way so that it can be removed if it interferes at any point with the opening and closing of the window. Slide the sash up and down several times to be sure it does not bind. If desired, a small metal plate can be used instead of the nail. The plate is notched to fit around the tubing with slight clearance and is screwed in position to the top edge of the sash.

Adjustable Hanger Aids Painting Screens and Storm Sash

You'll find it more convenient to paint both sides of window screens and storm sash if they are hung from this simple hanger which is fastened to a basement joist. It consists of a wooden strip to which are screwed the hook parts of a screen-and-sash hanger set. One hook is fastened in a fixed position and the other slides in a slot to accommodate screens of different widths. Wing nuts make it easy to adjust the sliding hook. When the distance between the hooks suits the spacing of the eye plates on the screen itself, the screen is hung on the hanger the same as on a window. When both sides are painted, the screen is lifted off ready for the next one.

Samuel Silberman, Bayside, L. I., N. Y.

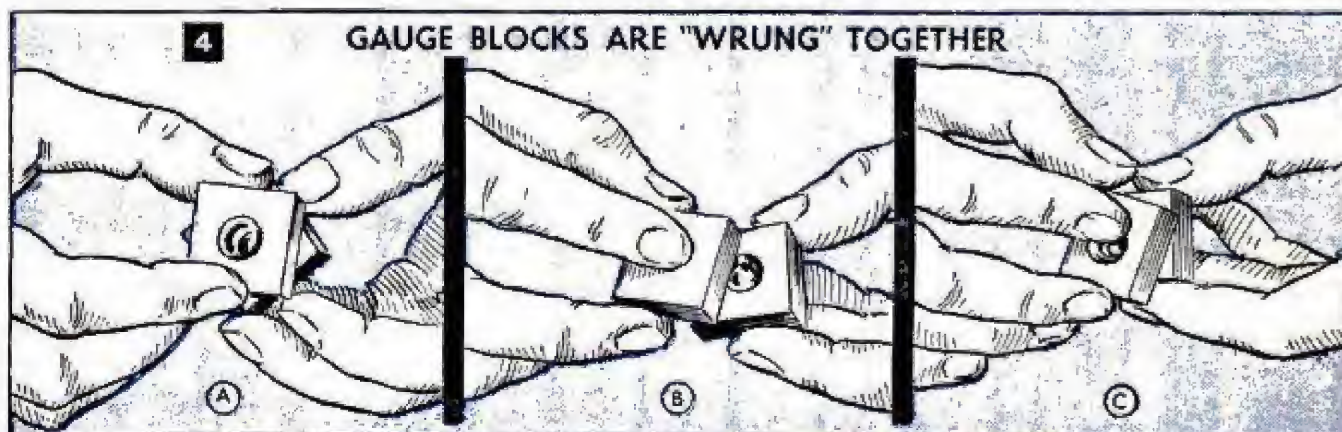


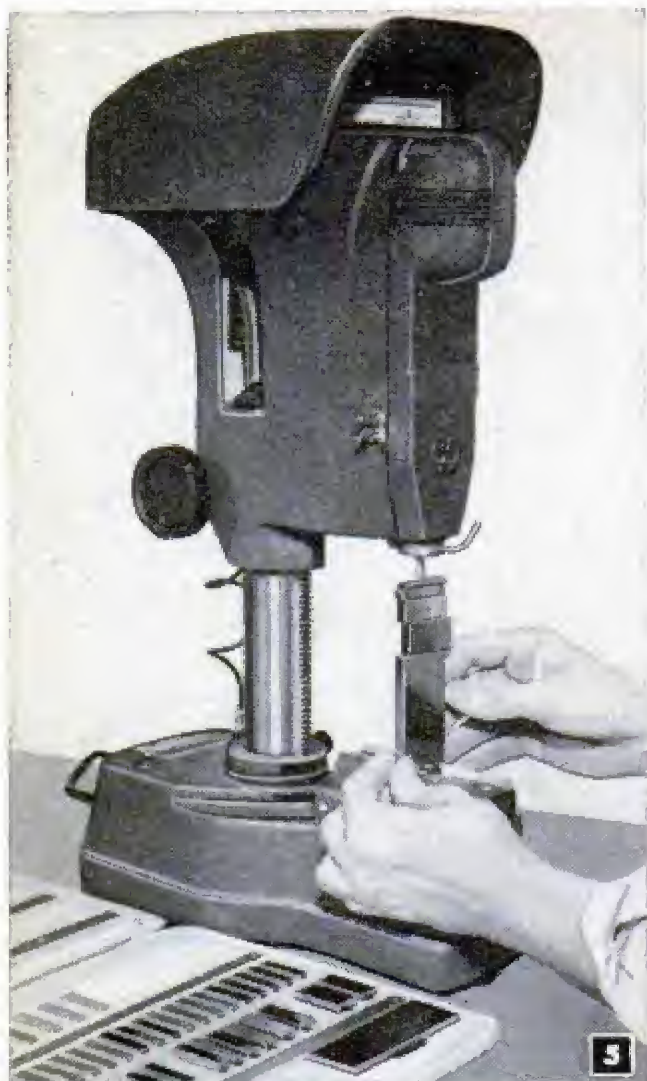
GAUGE BLOCKS *a standard for measurement*

By Alexander Maxwell

PRECISION gauge blocks are used in all well-equipped shops to establish basic measurements for the purpose of laying out and producing parts of identical size. When critical measurements are necessary in laying out work on which machine operations are to be held within extremely close limits, the use of gauge blocks speeds up the preliminary operations and practically eliminates the reworking of jobs due to faulty scales or an error in taking readings.

When a number of blocks are to be used together to establish a measurement or to check the accuracy of other measuring instruments, they should be cleaned thoroughly with a soft tissue or chamois. Blocks from which the protective coating of grease or light oil has not been removed, cannot give accurate measurements. After cleaning, the blocks must be "wrung" together as in Fig. 4, steps A, B and C. Although easy to do, the process of wringing gauge blocks requires delicate finger work. First, the two blocks are placed together centrally, as in A, to prevent scratching one block with a corner of



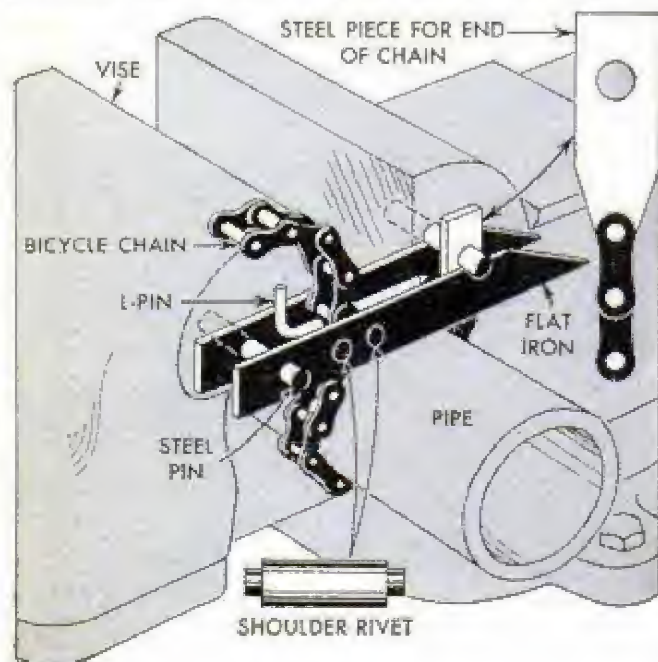


the other. Then the blocks are given a quarter turn and slid partially apart, as in B. Note that the blocks are only a little more than half out of engagement in this second position. In the third step, detail C, the blocks are slid back into full contact, being given a slight twist simultaneously so that the edges of both blocks are squared one with the other. This simple procedure excludes all air between the meeting surfaces and gives the complete metal-to-metal contact so essential to accurate work. Never leave the blocks wrung together for more than a few hours at a time. If left for longer periods it will be difficult to separate them. If it is necessary to use the same stack of blocks over a longer period of time, they should be separated and wrung together again. Always separate blocks by reversing the process of wringing together. Coat with grease when not in use.

Several common applications of gauge blocks are shown in Figs. 1, 2, 3 and 5. In Fig. 1, the height of the scriber point is being set accurately with a stack of blocks, both scriber pedestal and blocks being placed on a surface plate. Fig. 2 shows one method of setting an adjustable snap gauge, while in Fig. 3 a single block is used to check the accuracy of a small micrometer. Sensitive limit gauges are set with blocks as in Fig. 5. The accuracy of the setting is dependent on the scale reading and the sensitivity of the instrument.

Chain Attachment Adapts Bench Vise for Holding Pipe and Rod Stock

There's double duty to be had from a machinist's vise when it is equipped with this auxiliary attachment, as it then can be used for holding pipe and rod stock. The attachment is operated by movement of the vise jaws, and it pivots on a steel pin pressed in the side of the movable jaw.



Two flat-iron pieces are spaced apart by two shouldered rivets and a length of bicycle chain is passed between the two rivets and held with an L-pin which provides the necessary adjustment. The opposite end of the chain is riveted to a flat-iron link which fits over a pin in the rear jaw. Note that at the rear the flat-iron members bear against the underside of the pin. In use, the chain is wrapped snugly around the pipe and is held with the L-shaped pin. A slight pressure on the vise handle causes the chain to grip the pipe tightly and prevent it from turning.

Iron Pipe Protects Wagon Endgate

To prevent damage to the front endgates of his wagon when using it behind a mechanical cornpicker, one farmer mounted a length of iron pipe across the front of the wagon box above the endgate. He supported the pipe by a piece of flat iron bolted vertically to each side of the wagon so that it projected about 2 in. above the top of the wagon box. The flat iron is drilled to take an endgate rod which is passed through the pipe to hold it in place.

Sea Craft

a 25-ft. CABIN CRUISER

Part IV

BY EDWARD COLBY



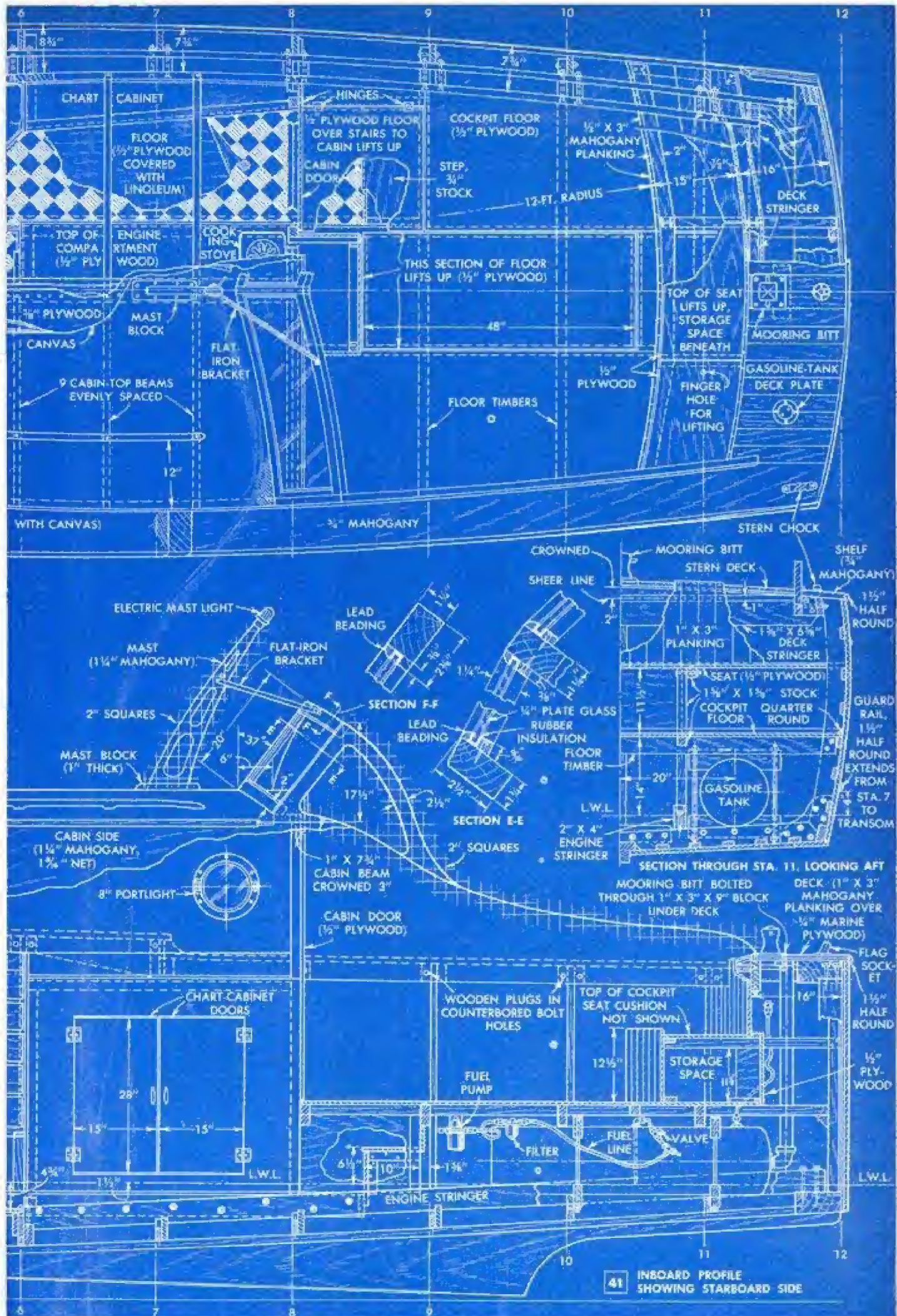
Top of engine compartment in cabin serves as table when preparing food

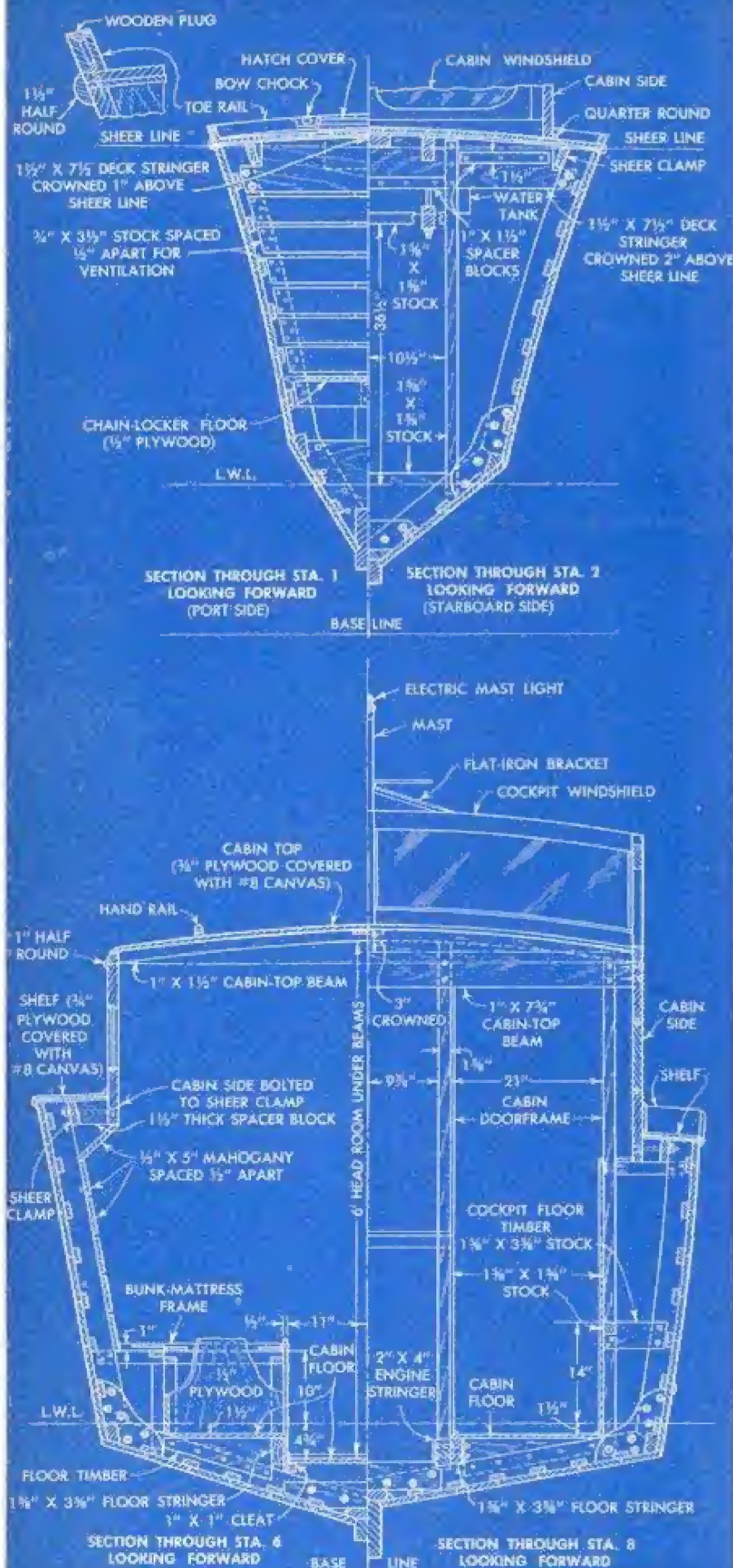
THE SIZE of the cabin and the arrangement of the bunks, cabinets and bulkheads is a matter of personal choice and may be changed without affecting the performance of the boat. If more headroom is required, the cabin sides can be made higher or, if less headroom is desired, the cabin floor may be raised slightly. Also, the length of the cabin can be shortened to provide a larger open cockpit. However, regardless of the changes made, the methods of construction shown in the drawings should be followed. All structural members must be fastened to the frames, never directly to the hull planking. Stock-size fir or spruce can be used for most of the framing and the plywood must be of the type made especially for marine use.

Sea Craft's forward deck extends from the bow to station 2. Two deck stringers,

shown in the upper drawing of Fig. 42, are bolted to the aft and forward sides of the frames at stations 1 and 2 as shown in Fig. 38 of Part 3. The top edges of the stringers are notched for the cradle of the freshwater tank and a 1½ by 6-in. center beam, which is bolted to the stringers as shown in Figs. 30 and 38 of Part 3. The shape of the cradle, which is made of 1½ by 3-in. oak, must be determined by the tank dimensions. Refer to the perspective drawing, Fig. 33, for clarification. The frame for the hatchway opening, indicated in Fig. 38, projects 2 in. above the stringer. This opening gives access to the chain locker, which is floored and partitioned as shown in Figs. 30 and 42. Cleats of 1 by 1-in. stock, screwed to the sides of the hatchway frame flush with the top edge of the stringer, support the ¼-in. plywood, which is screwed







down to cover the entire deck area. After the plywood has been covered with marine glue and canvas, it is planked with $\frac{1}{2}$ by 3-in. mahogany. The white lines between the planks are made by beveling the planks slightly, as for calking, and then filling the resulting grooves with sealing compound. Although the 3-in. planking can be laid to the sheer line, a margin plank on each side, as in Fig. 40, will improve the appearance. Details of the bulkhead at station 2 are given in Figs. 41, 42 and 43 and also in Fig. 34 of Part 3.

The cockpit floor is supported by timbers which extend athwartships and bolt to the forward sides of frames 9, 10 and 11 and the aft side of frame 8. A portion of the cockpit floor timber at station 8 is sawed out later for the stair well to the cabin. Note in Fig. 40 that the center section of the floor is removable and that it rests on two strips of $1\frac{5}{8}$ by $1\frac{5}{8}$ -in. stock which are notched into the athwartship floor timbers. The outboard edges of the strips are located directly above the engine stringers. These pieces extend from station 8 to the vertical transom braces. Fig. 37 of Part 3 shows this section of floor removed.

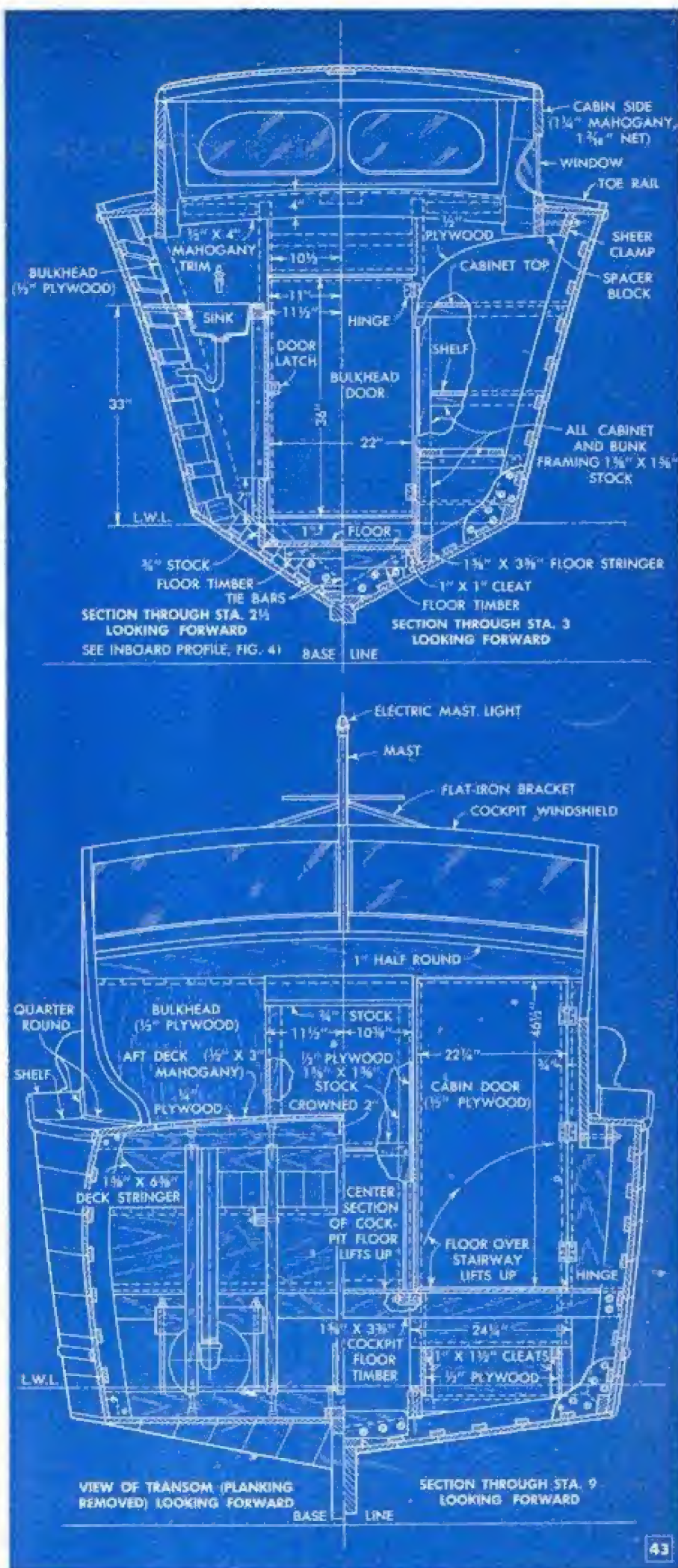
The stern-deck stringer, which is crowned 2 in., the same as the top transom timber, is placed 16 in. forward of the transom and lag-bolted to a 3-in. knee block fastened to the sheer clamp and transom timber as indicated in Figs. 40 and 41.

The cabin sides are installed next. First make the $1\frac{1}{2}$ -in.-thick spacer blocks shown in Fig. 40. Considerable fitting will be required when installing the blocks. The in-board edges of the blocks must be perpendicular to

the base line and their top edges must be on a slight downward angle to the sheer line to coincide with the 2-in. crown of the decks. When fitted, toenail them to the sheer clamp. Note that the dimensions for the blocks at stations 3, 4 and 5 have been omitted. These blocks are installed after the cabin sides have been clamped in position.

Each cabin side is made up of three pieces of $1\frac{1}{4}$ -in. ($1\frac{1}{16}$ in. net) mahogany, splined and glued as indicated in Fig. 31 of Part 3. The total width of the glued-up boards should be not less than 28 in. If three $9\frac{1}{2}$ -in. boards are used, each side will require two pieces 20 ft. long and one piece 16 ft. long. However, if the headroom is to be increased, the width of the cabin sideboards must also be increased. To lay out the shape of the sides, joint the seam edges of the boards and lay them together on a flat surface. As the lower corners of the cabin sides are notched to fit $3\frac{1}{2}$ in. below the sheer line between the bulkhead at station 2 and the stern-deck stringer, the developed length must be obtained. This can be done best by fairing a batten against the blocks and cutting it off to fit between the bulkhead and the stringer.

With the batten in place, mark the position of each station on it, then remove, place on the cabin sideboards and transfer the station locations to the sideboards. Draw lines across the boards perpendicular to the seams at the station marks and ends of the batten. Note in Fig. 40, section G-G, that the cabin side projects over the forward deck $5\frac{1}{2}$ in. A chalk line parallel with and $6\frac{3}{4}$ in. above the L.W.L. is





View showing interior of cabin, looking forward. Top corner of engine compartment at left foreground, chart cabinet at right

stretched between two temporary upright braces at station 2 and the transom to represent the top of the cabin sides. The distance between the chalk line and the bottom of the sheer clamp or blocks at each station is measured and transferred to the cabin sideboards. A line connecting these points gives the bottom cutting line of the cabin side. The line between stations 6 and 7 drops abruptly because of the sheer drop. The curved lines of the cockpit sides and cutouts for the windows are drawn free-hand with aid of a pattern of squared lines drawn lightly on the boards as in Figs. 30 and 41. The aft ends of the cabin sides project about $1\frac{5}{8}$ in. over the stern deck. When cutting the spline grooves, stop them so they will not run out in the end grain of the windows and the curve of the cockpit sides. The forward edge can run out as it is covered by the windshield frame. When assembling the boards, use marine glue and clamp securely until dry. Then lay out the port-light hole and the forward end which slopes about 36 deg. off the vertical. After sawing, rabbet the edges of the window openings as shown in Fig. 31 of Part 3, to take the plate-glass windows, which are installed later. As both cabin sides are the same, the completed one can be used as a pattern to lay out the second side. Care should be taken to make the rabbeted edge around the window openings on the outside of each piece.

When installing the cabin sides, nail temporary tie bars across frames 5, 6 and 7 just below the sheer clamps, and use timbers and wedges or automobile jacks at stations 6 and 7 to force the cabin sides against the spacer blocks. Before making the spacer

blocks for stations 3, 4 and 5, wedge and clamp the cabin sides until they are fairly straight between stations 2 and 5 so the window glass will seat tight against the rabbeted edges. When the sides are clamped firmly in position, bolt them to the sheer clamps at each spacer block with large-headed, $\frac{3}{8}$ -in. galvanized carriage bolts. Countersink all bolts and plug the holes for neat appearance.

Before removing the clamps, install the cabin-top beams shown in Fig. 40 and Fig. 35 of Part 3. The forward beam is placed $7\frac{1}{4}$ in. aft of the forward top corners of the cabin sides. The other frames are spaced uniformly with one directly above the frame at station 6. They are screwed to the top edge of the cabin sides and have filler blocks between them as in Fig. 39 and Fig. 31 of Part 3. The aft beam is

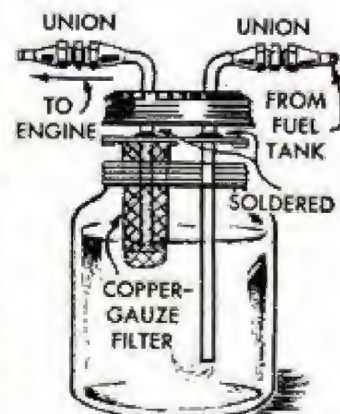
cut off flush with the inboard sides of the cabin sides and screwed to the 1 by $7\frac{3}{4}$ -in. beam shown in Figs. 41 and 42. The top sides of the beams are notched in the center to take a $\frac{1}{2}$ by 4-in. piece of mahogany as shown in Fig. 40.

Stock-size lumber is used for the cockpit-bulkhead framing dimensioned in section 8 of Fig. 42. The framing for the engine compartment, toilet room and chart cabinet, shown in Figs. 30 and 35 of Part 3, is an integral part of the bulkhead framing and should be installed at this time.

(To be continued)

Large Fuel-Settling Bowl Made From Fruit Jar

For a boat where water in the gasoline is a problem and the small sediment bowl requires constant attention, an efficient settling bowl of larger capacity can be made from a quart-size fruit jar. Obtain a jar with a screw-type metal cap and two pieces of copper tubing, one long enough for the intake and a shorter piece for the outlet. Solder the tubing to a metal disk as indicated, and cover the outlet tube with fine copper gauze to filter foreign matter that may not settle in the tank. Mount the jar in a convenient position in the fuel line.



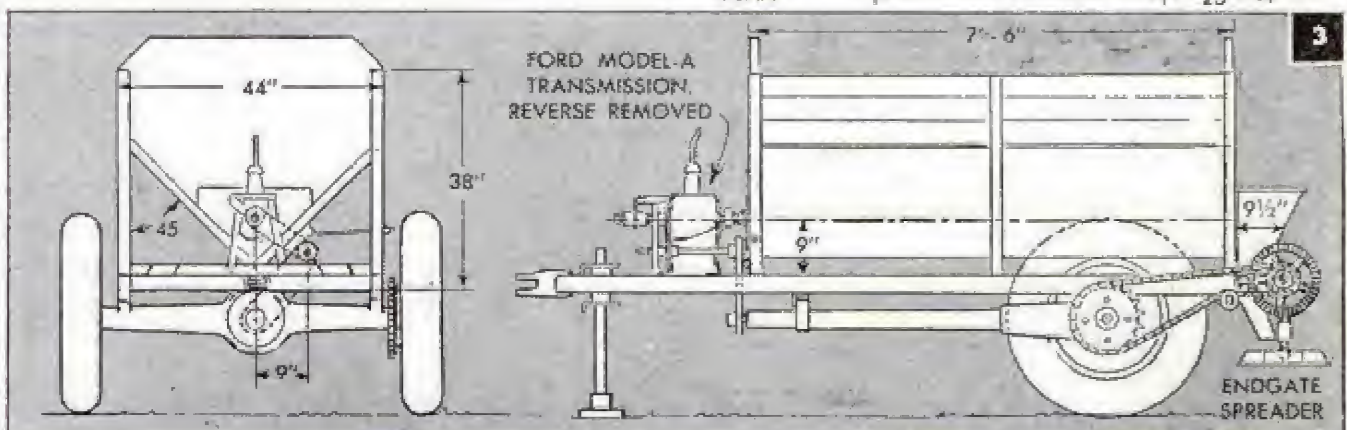
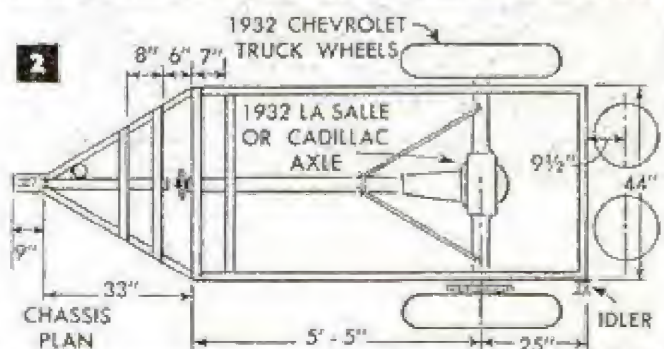
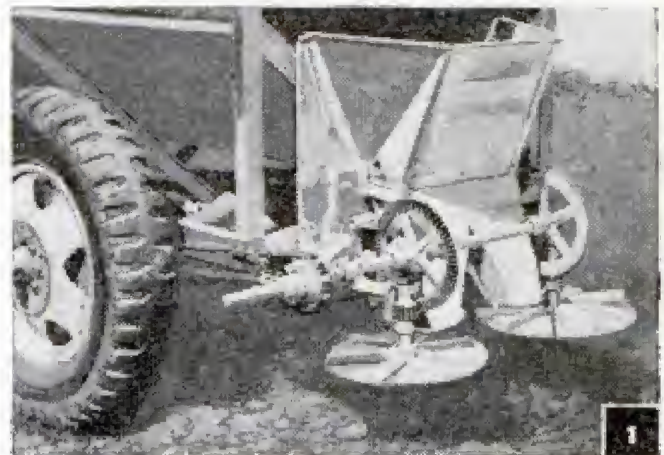
SPREADER for DRY FERTILIZER

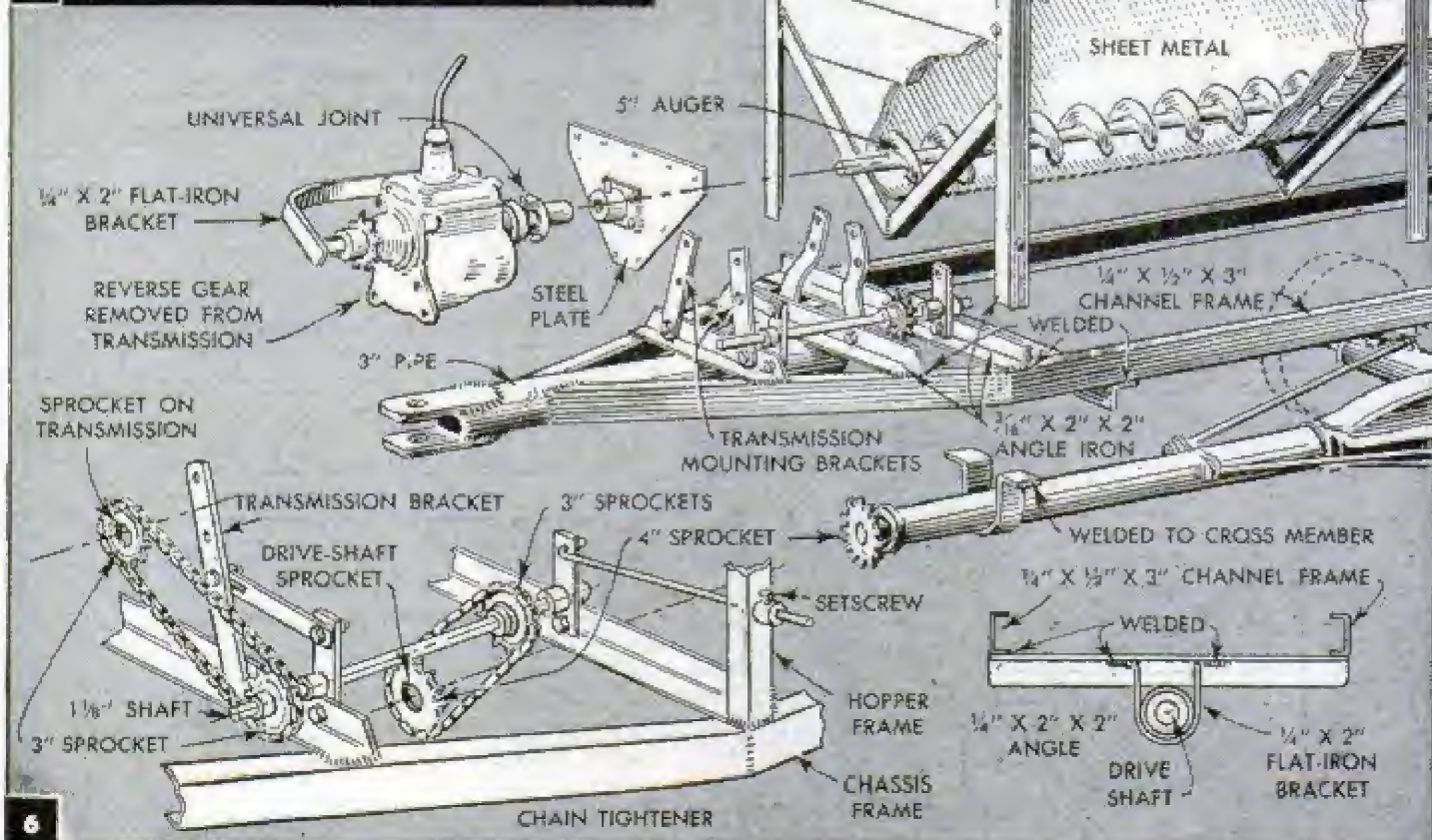
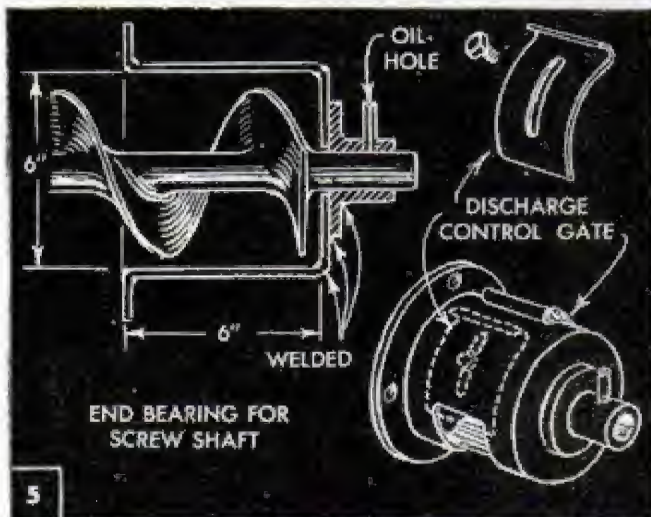
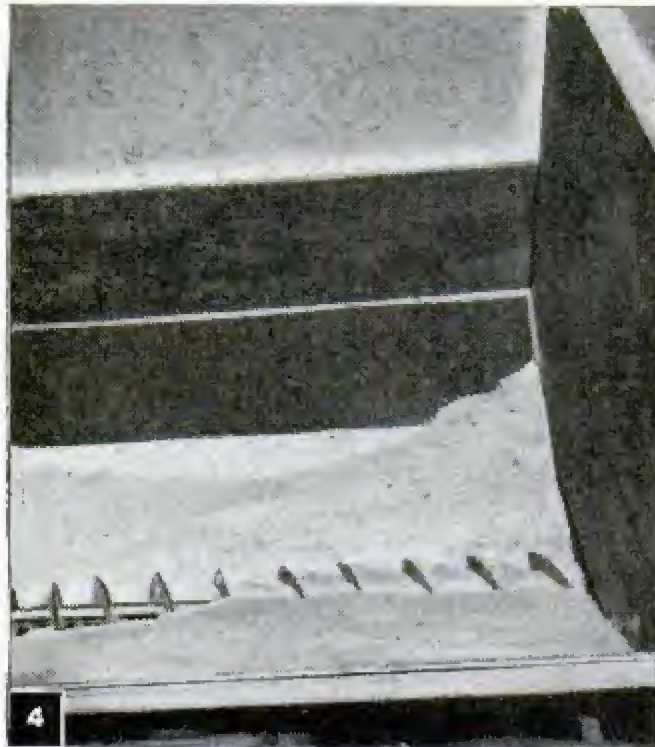


By Hi Sibley

BUILT by Viking Ramsing of Nuevo, Calif., and assembled from discarded automobile and farm-implement parts, this labor-saving spreader enables one man to apply gypsum, lime, sulphate of ammonia and other concentrated plant foods quickly and evenly at tractor speeds. It consists of a hopper of 2-ton capacity mounted on a heavy two-wheel trailer. A 5-in. materials auger in the bottom of the hopper, Fig. 4, carries the contents to an endgate-type distributor or spreader which is mounted on the rear of the trailer frame and ground-driven from one of the trailer wheels. The hopper screw is chain-driven from the trailer axle through an auto transmission from which the reverse gear has been removed. The whole thing can be towed by any small tractor and is easily maneuvered on its two wheels.

The transmission is taken from a Model-A Ford, the axle from a 1932 Cadillac and



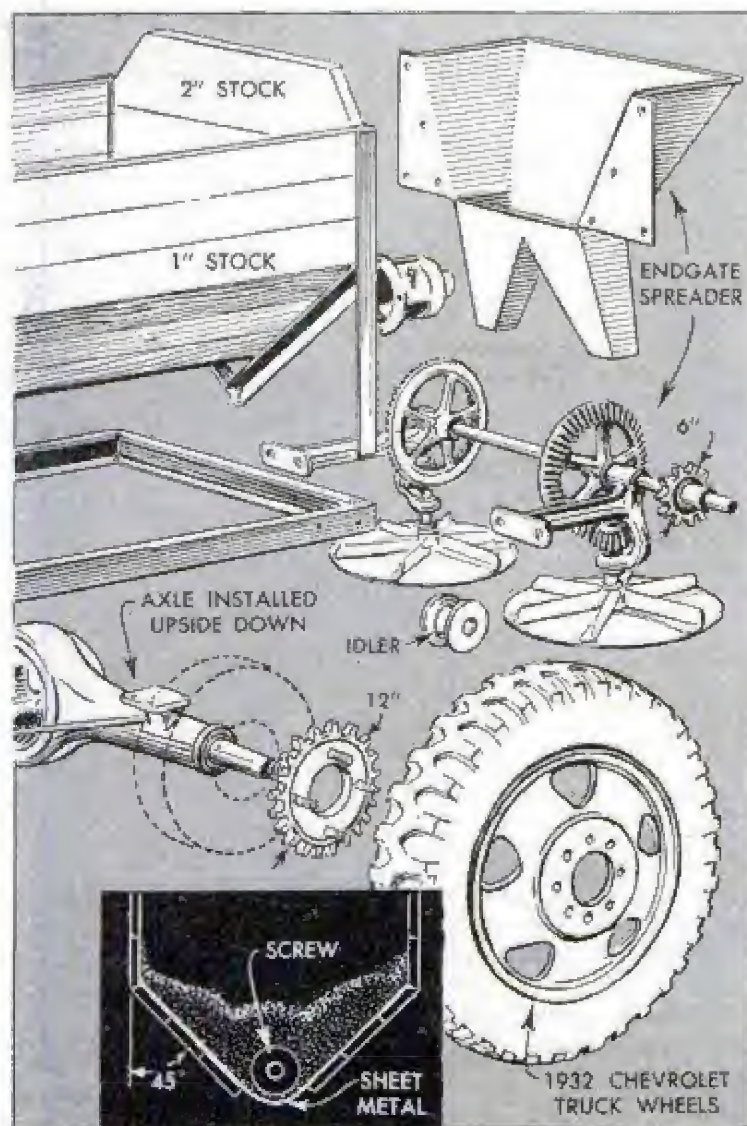


the wheels from a 1932 Chevrolet truck. The endgate distributor, Fig. 1, is a standard unit. A plan view of the chassis is shown in Fig. 2, while front and side views are shown in Fig. 3. The jack at the forward end, Figs. 3 and 7, is made from two pieces of pipe, the sliding member or leg being cut from 1½-in. pipe. This telescopes into a sleeve of 2-in. pipe welded to the drawbar. Holes are drilled in the two members to take adjusting pins, Fig. 7. Side members of the frame are 3-in. steel channels strengthened by angle-iron cross braces, or spreaders. The legs of both channels are notched at a point near the forward ends and the channels are bent inward, the ends being welded to a length of 3-in. pipe to form the drawbar. Dimensions are not given on these parts as size must be determined during assembly.

Note that the frame for the wooden hopper is made from angle iron, with a channel formed in the upright angle at each corner by welding in a strip of flat iron as in the upper detail in Fig. 6. Ends of the wooden sideboards fit loosely in these channels. In order to drive the auger in a counterclockwise direction through the transmission, the Cadillac rear axle is in-

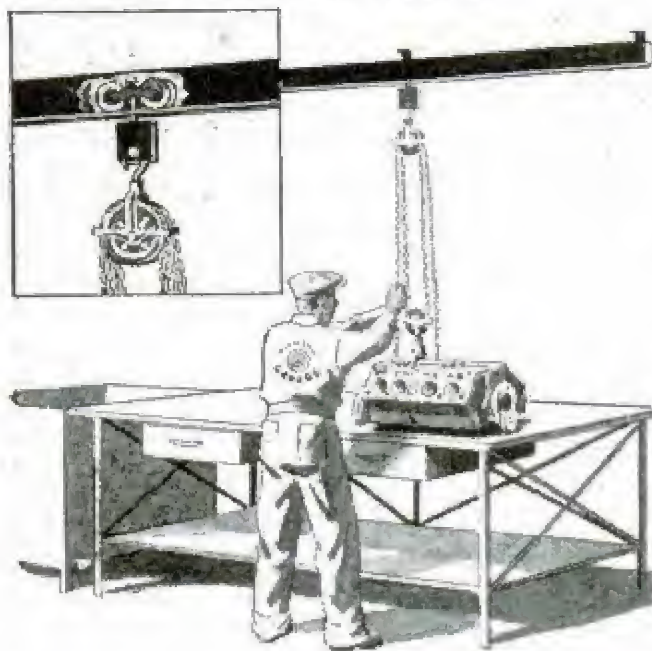
stalled upside down, the spring seats being welded or bolted to the trailer frame. A U-shaped strap welded to an angle-iron cross brace of the frame supports the drive-shaft housing, Fig. 6. A 4-in. drive sprocket is fitted on the end of the drive shaft. This drives a countershaft which, in turn, drives the transmission. The drive assembly is shown in the lower left-hand detail, Fig. 6. The bracket and support arrangement shown in Fig. 6 must be fitted to the transmission at the time of assembly.

The hopper bottom boards are set at a 45-deg. angle with the sides and are covered with sheet metal. Rear end of the auger carries the hopper contents into a cylinder or distributor head, made from 6-in. pipe to which a flange is welded as in Fig. 5. Holes are drilled in this flange so that it may be bolted to a triangular-shaped steel plate which, in turn, is bolted to the end of the V-section of the hopper in the same manner as a similar plate is attached to the opposite end of the hopper back of the transmission. Flanged bearings attached to the plate at the front of the hopper and to the back of the distributor head carry the auger shaft. Square openings are cut in the distributor head, Fig. 5,



and adjustable sheet-metal gates fitted over these openings control the amount of material fed to the spreader hopper. The adjustment of these gates provides for feeding various materials to the spreader in sufficient amounts to maintain a uniform rate of spreading. Usually, the spreader unit is provided with an adjustable gate with which settings can be made by means of a scale and pointer to distribute varying quantities of material per acre. The three-speed auto transmission permits changing the speed of the auger. This provision, in addition to the control gates in the distributor head and the variable-gate settings in the spreader, gives a range of adjustment which makes it possible to spread almost any quantity of fertilizer per acre. The drive chain for the spreader is carried over an idler mounted on the rear of the frame, Fig. 3. Although the drive sprocket is shown mounted inside the trailer wheel, some users will prefer to have it mounted outside the wheel so that the chain can be removed when the trailer is to be used for other purposes or hauled idle for long distances. With minor changes in dimensions, other auto parts can be substituted for those specified. However, the ones specified were found to be best suited for the purpose. When the unit is to be stored, oil all metal parts to prevent corrosion.

Hoist Attached to Barn-Door Hanger Serves as Overhead Crane

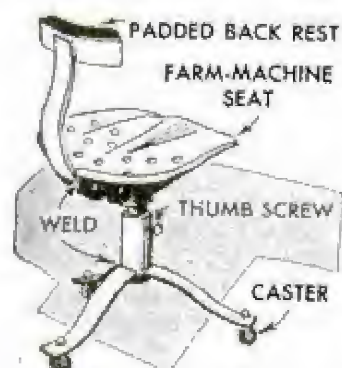


When hoisting engine blocks and other heavy parts from a hand truck to the workbench, one mechanic attaches a chain hoist to a barn-door hanger of the type that runs in a square track. The track is bolted to the ceiling joists. For convenience in lifting machinery from the truck, extend the track beyond one end of the bench. Caps are provided at each end of the track to serve as stops.

Jerome Ford, Lancaster, Ohio.

Converted Farm-Machine Seat Makes Useful Shop Chair

Constructed from an old farm-implement seat, several pieces of flat iron and two lengths of pipe, this sturdy chair will find many uses where durability is more desirable than appearance. Bend three flat-



iron legs as shown, drill them to hold casters and weld to the end of a short length of pipe. Obtain an old tractor seat of the type having a separate back rest and weld the back rest to the seat. Then, get a length of pipe that is a

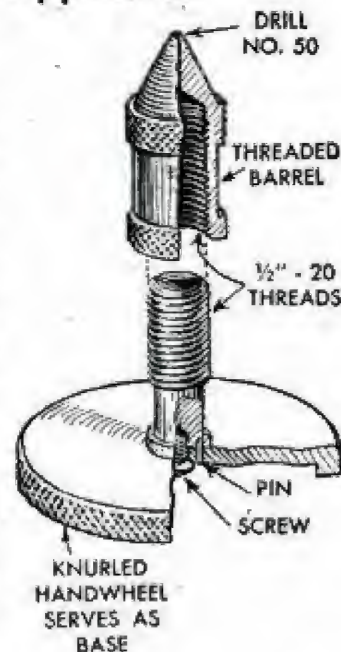
slide fit in the first one and weld it to the bottom of the seat. The length of the pipe, of course, will determine the height of the chair. The height can be made adjustable by drilling and tapping the base pipe to take a thumb screw, or by drilling one hole in the base pipe and several in the sliding pipe and setting the height with

a pin. If you do not want the height of the chair to be variable, make the inside pipe a little longer than the base pipe and thread the end for a pipe cap. This will keep the seat from pulling out when lifted. To make the chair comfortable, pad the back rest and use a cushion.

Elmer Vandrey, Truman, Minn.

Lathe Lubricant Applicator

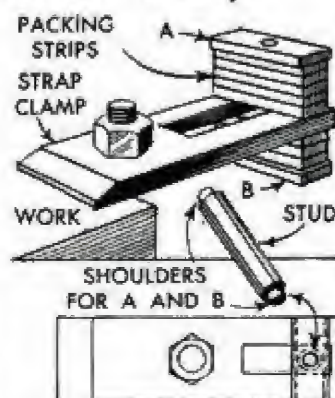
Made of either metal or plastic, this convenient applicator for lathe-center lubricant keeps the lubricant clean and makes it easy to apply. It's designed so that the knurled hand-wheel, which can be of hardwood or plastic, also serves as a base for the unit when not in use. The barrel and plug are threaded and when the barrel is turned the plug



forces the lubricant out of a small hole drilled through the tip of the barrel. The handwheel is attached to the plug with a machine screw, and is pinned. A good lubricant is made by mixing equal parts of graphite grease and white lead.

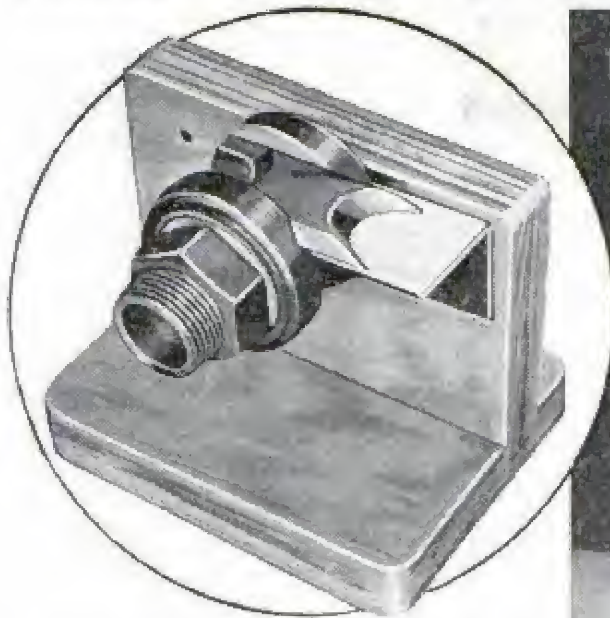
Adjustable Hold-Down Clamp

To save searching for a spacer block to level a strap-type hold-down clamp, here's a clamp that gives you the height you want merely by slipping packing strips, or spacer blocks, through a slot in the clamp jaw. Cut the packing strips from heavy-



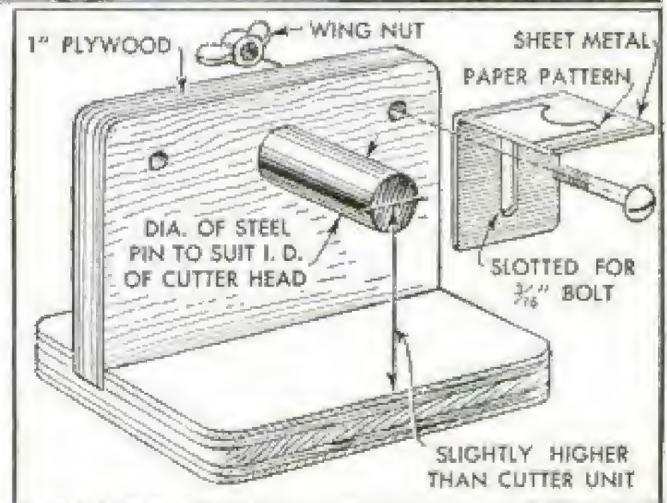
gauge sheet metal, making the end strips, A and B, larger than the slot and the others small enough to pass through the slot. Drill the end strips to fit over tenons turned on a stud and drill the remaining strips to turn freely on the stud. Then, assemble the stud and packing strips on the strap clamp, and peen the tenons of the stud to hold the end strips permanently in place.—H. Moore, Leeds, England.

Fixture Aids Accurate Setting of Shaper Knives



This handy fixture permits quick and accurate depth-setting of shaper knives held between collars, and also serves as a template for grinding identically the lips on common three-bladed cutters. As knife collars vary in design and size, exact dimensions for the fixture are not given. The base and upright are of plywood and a steel shaft to fit the cutter head is pressed into an undersize hole in the upright. An adjustable sheet-metal stop is fastened with a bolt and wing nut on either side of the shaft to accommodate both right and left-hand cutter heads. To use the fixture, a piece of paper is glued to the stop. The cutter head is placed on the shaft, held firmly against the upright and the outline of the cutting edge of one of the knives is traced on the paper. Then, the other knife is adjusted to the exact same depth by bringing the edge of it to the traced outline.

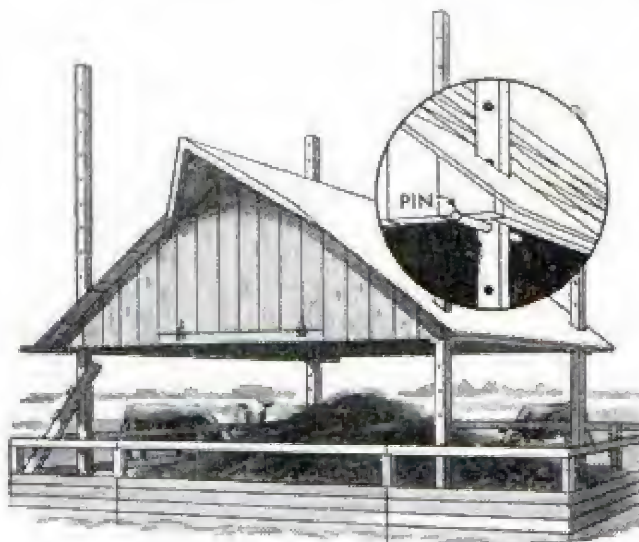
Richard Hanscom, Elmhurst, Ill.



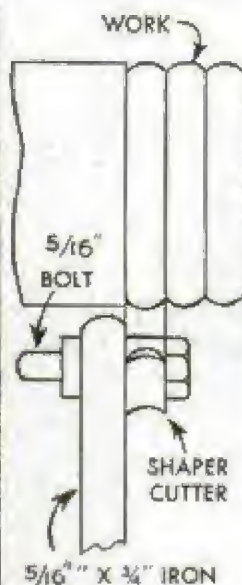
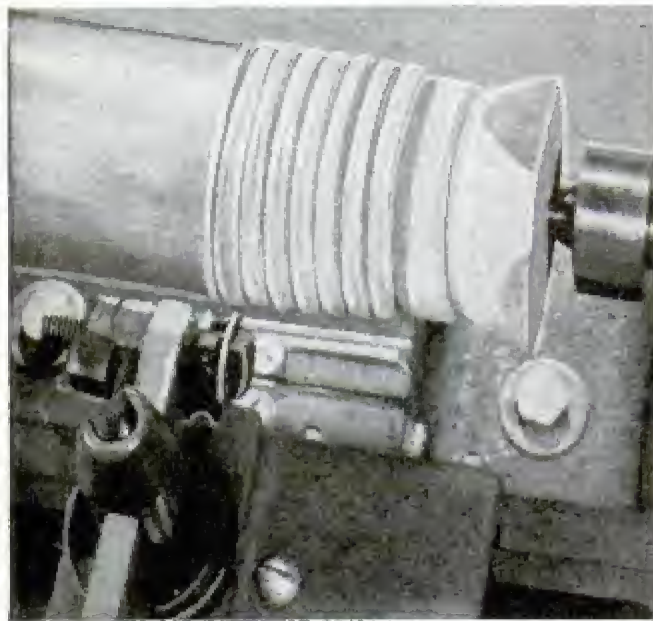
Hay Barrack Has Adjustable Roof

This unusual hay barrack with a roof that can be raised or lowered to various heights was built by one farmer in his cattle-feeding yard. The hay is pitched from the top of the stack to a manger fenced off around the bottom. As the height of the haystack decreases, the roof is lowered to provide the greatest possible amount of protection for the hay. The four long poles at the corners of the barrack are drilled at convenient intervals to take pins which support the roof at the desired height. A door and a short hay track are built into the gable. A block and tackle is used at each corner to raise the roof.

A. M. Wettach, Mt. Pleasant, Iowa.



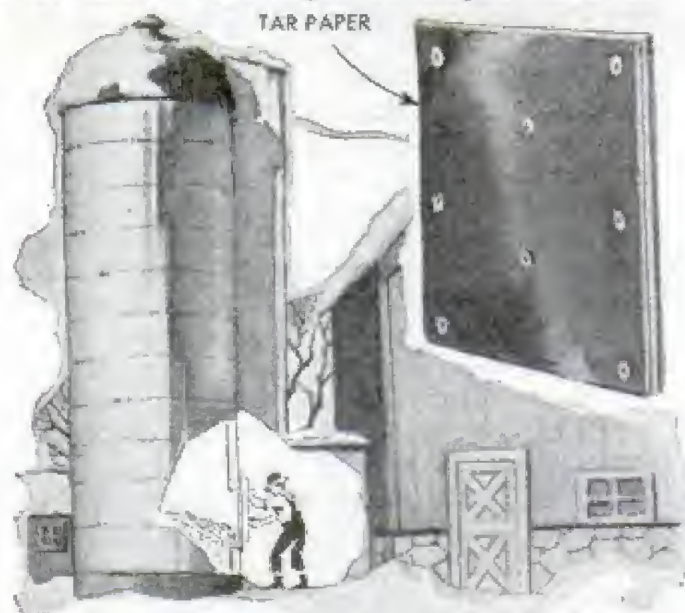
Shaper Cutter Mounted in Lathe Tool Post Permits Turning Uniform Beads and Coves



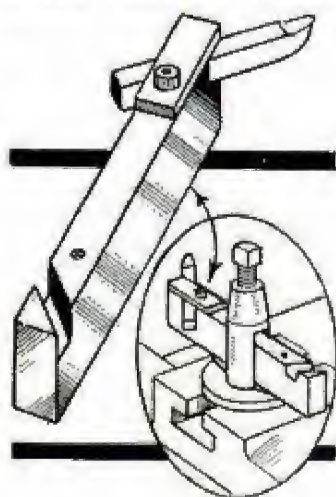
Turning small beads and coves and spacing them uniformly is easy to do if a shaper cutter is used. To do this, bolt a small cutter of the desired profile to a piece of $\frac{5}{16}$ by $\frac{3}{4}$ -in. flat iron. The end of the flat iron should be rounded and the cutter mounted near enough to it to allow the rounded end to serve as a depth stop. Then fasten the unit in the tool post in the usual manner. To obtain the best results on wood, set the cutter on the work center line, but when using the cutter on plastics, set it at approximately a 10-deg. negative rake.

Silage Will Not Freeze to the Inside of Door Having Tar-Paper Cover

If you want to keep silage from freezing to the doors in cold weather, next time you fill the silo, try covering each door on the inside with tar paper. In most cases this will keep the silage from freezing and sticking to the door so that it has to be chopped away. Ordinary roofing nails are used to fasten the paper in place and it should be left there permanently.



Dual Tool-Bit Holder



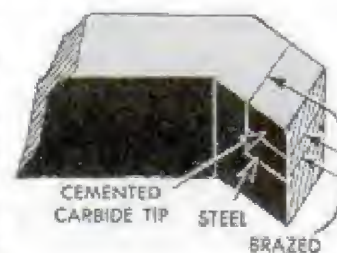
Saving the expense of a separate right and left-hand tool-bit holder, this holder incorporates both in one tool. It is made from cold-rolled bar stock and machined to fit the lathe tool post. Notches are cut and filed in each end at a 45-deg. angle to receive standard $\frac{3}{16}$ or $\frac{1}{4}$ -

in. tool bits. An interchangeable clamping pad locks the bit securely in either end. Positive clamping is assured by filing the notches to a depth slightly less than the thickness of the tool bit. A machine screw tightens the clamping pad.

☐ Try lubricating an electric drill by dipping the bit into a can of oil. This will save time and dissipate heat effectively.

Repairing Carbide-Tipped Tools

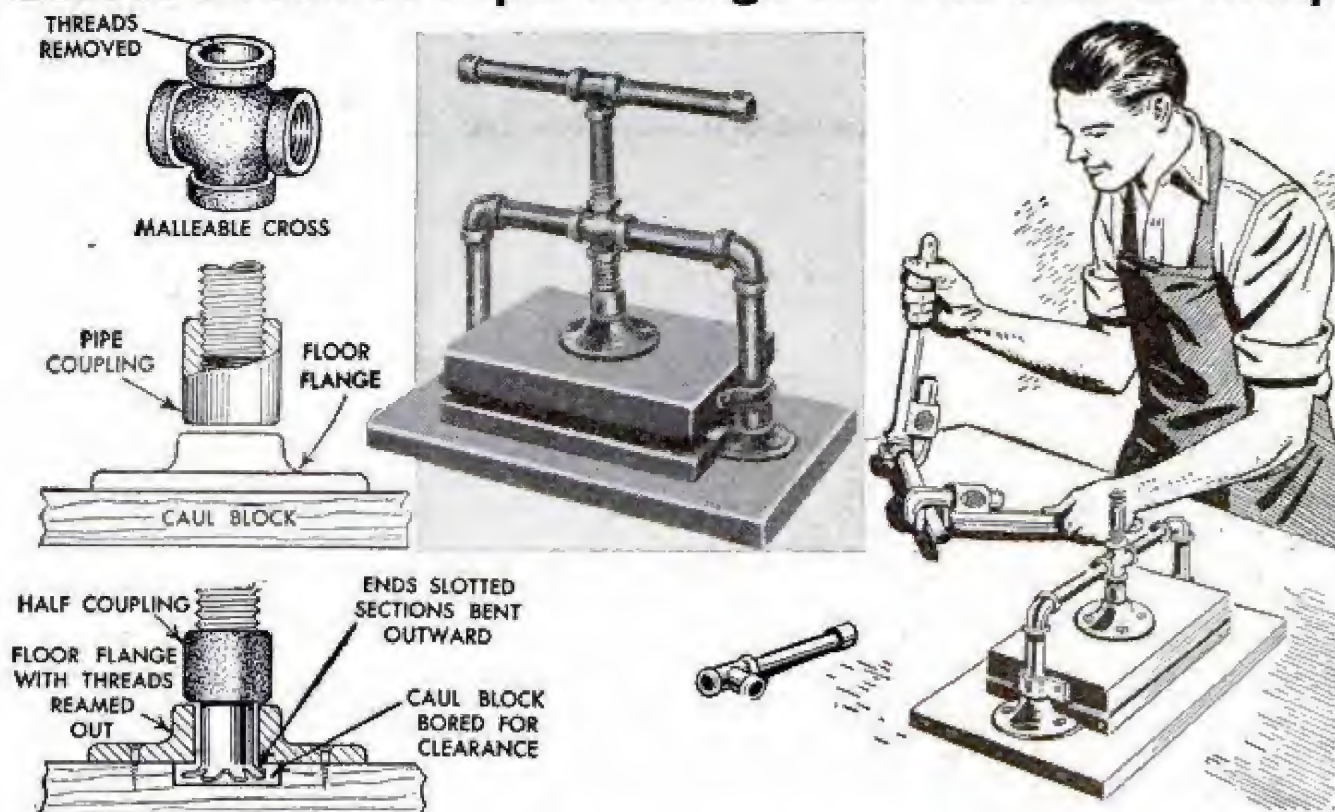
When a large carbide tip on a high-speed bit has broken and the bit underneath the tip is damaged, one machinist repairs the expensive tool in the following manner. First, he anneals the end of the bit and cuts out the damaged portion. Then he cuts a piece of steel to replace the removed part of the bit and brazes this and a new carbide tip to the original bit.



First, he anneals the end of the bit and cuts out the damaged portion. Then he cuts a piece of steel to replace the removed part of the bit and brazes this and a new carbide tip to the original bit.

Harold Peterson, N. Troy, N. Y.

Letter Press of Pipe Fittings for the Home Shop



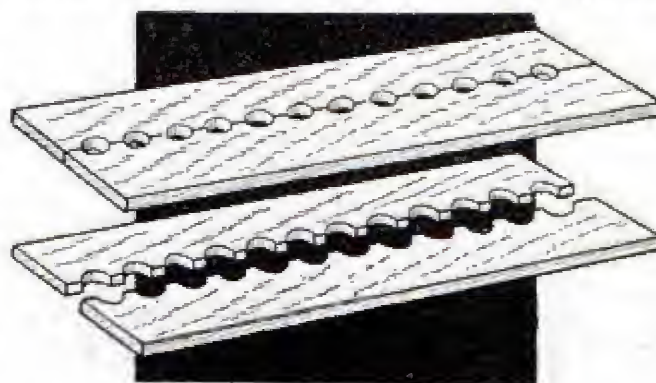
There's nothing quite so handy in the home workshop as a letter press when it comes to veneer work and other small gluing jobs. Commercial presses are expensive, but you can have this sturdy press in your shop just for the cost of a few pipe fittings. The fittings needed are three floor flanges; two elbows; six nipples, or seven if you use the method of mounting the spindle on the caul block shown in the lower left-hand detail; two pipe caps; two tees, or one tee and a cross; and a length of threaded pipe for a spindle. To make the press, fashion the base, caul block and base block of thick hardwood. Screw the flanges and base block to the base and assemble the frame. If a cross is used to take the spindle, the threads must be removed from the top opening. These may be bored out on a lathe, or you can take the cross to a local plumbing shop and have the threads

reamed out. If a tee is used instead of a cross, drill a hole through the top of the tee to permit insertion of the spindle. The caul block is guided between the vertical nipples of the frame by means of pipe straps fastened to the ends of the block. A pipe coupling is turned on the lower end of the spindle to press down on a floor flange fastened to the top of the caul block. If this method is used, the caul block will have to be raised by hand. However, if you wish the spindle to raise the caul block, have the threads of the flange reamed out and turn a nipple into the bottom of the spindle coupling. The lower end of the nipple is slotted and the sections bent outward to hold it to the flange. The caul block must be recessed to clear the pipe-nipple sections. The handle is made from two nipples, two pipe caps and a tee.

John Wolff, Palisades Park, N. J.

Scalloped Boards Made Easily by Drilling Holes and Sawing Apart

Here is an easy way to make identical, evenly spaced scallops in boards for decorative molding and window valances. First, a line is scribed lengthwise along the center of a board. Equidistant points are marked along this line, and then a series of holes is drilled through the board at the points marked. The size of the holes determines the width of the scallops. After the holes are drilled, the board is sawed in half along the scribed line. This will result in two identically scalloped boards.



Ribbon Tabs Aid in Removal Of Button Dies



Finding it irksome to remove snug-fitting button dies from the recesses of the case, I thumbtacked one end of a piece of ribbon near each recess and simply pushed the die in place over the ribbon as shown. The free end of the ribbon provides a convenient tab with which to lift the die.

Ray Harrison, Dafoe, Sask., Can.

Tape Protects Fender Bead When Pounding Out Dent

Here's a way to avoid splitting or cracking the bead on a fender when pounding out a dent. Simply apply masking tape along the bead near the dent. Use $\frac{3}{4}$ -in. tape and apply three or four layers. Be

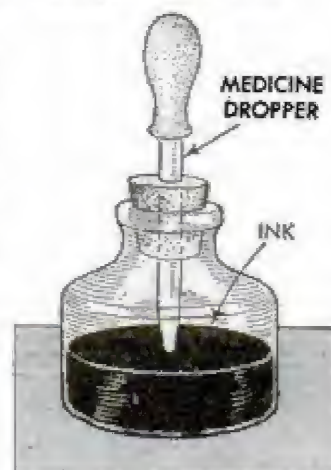


sure that the surface of the bead is cleaned thoroughly before the tape is applied; otherwise it may not adhere firmly.

Medicine Dropper Dispenses Ink

An ordinary medicine dropper and a cork will serve to make a dispenser that will accurately meter the amount of India ink put into a ruling pen. Remove the regular quill and select a cork to fit the bottle. Drill a hole in the center of the cork to take the dropper tube tightly. Then adjust the height of the tube so that the lower end is slightly above the bottom of the bottle when the cork is pressed tightly in place.

Julius R. Jung, Jr., New Orleans, La.



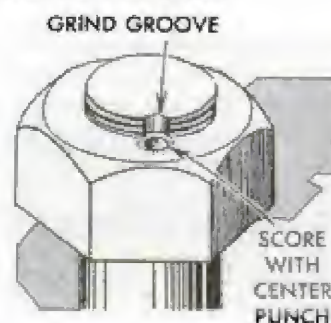
Tin-Can Protector for Seedlings

To protect seed plantings of chestnuts and similar varieties of trees subject to attack by rodents, the tin-can method has been developed. Use No. 2 cans and cut a cross in the bottom. The open end is forced into the ground over the plant or seed until the top is at ground level. Then the four points of the cross are turned up to allow space for the plant to grow. The sharp points discourage digging by rodents. The can will rust away before it interferes with the growth of the plant.

Center-Punch Mark Locks Nut

A lock washer usually will score soft metals badly. To avoid this damage, lock a nut this way: File or grind a short groove in the threaded end of the bolt. Then run the nut down and draw it tight. Place a center punch on top of the nut at a point opposite the groove in the bolt. Incline the punch slightly away from the bolt and strike lightly with a hammer. This will indent the nut sufficiently to force a small lug of metal into the groove. This lug will prevent the nut from loosening due to vibration.

Earl R. Goddard, Denver, Colo.



Watch Out for WARPING!

by Sam Brown

WARPING is one of the home craftsman's biggest headaches. After spending considerable time, money and painstaking care in producing a fine piece of furniture, it is disheartening and a keen disappointment to have it later warp and shrink and come apart. But shrinkage and warpage can be held to a minimum by proper conditioning of the wood and by maintaining a close check of its moisture content at the time it is fabricated.

How wood warps: Wood shrinks and warps in definite relation to the direction of the annual rings, and shrinkage is about twice as great when the direction is parallel with the rings as when it is across them. This basic principle is illustrated in Fig. 4. Quartersawed (edge-grain) lumber shrinks the least because the heaviest shrinkage takes place across the narrow dimension of the board. Flat-cut boards have the greatest shrinkage across their wide dimension where it is more noticeable. Also note, Fig. 3, that flat-cut boards tend to cup away from the heart side. This is an important point and should be remembered in joinery.

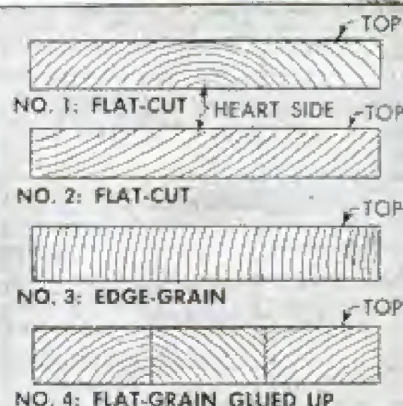
Detecting warp: Any irregularity caused by warp should be removed because a board that is warped even slightly will continue to twist no matter how it is used. Cup warp, Fig. 8, is detected with a straightedge placed across the board, whereas twist or wind is determined with a pair of winding sticks, Fig. 1, or by placing a straightedge from corner to corner, as shown in Fig. 7. Both methods will reveal two high corners if twist is present, and consequently planing should be done diagonally from high corner to high corner.

Conditioning: Conditioning means seasoning the wood to the proper moisture content (M.C.) to correspond

TESTING BOARD FOR TWIST (WIND) BY USE OF WINDING STICKS

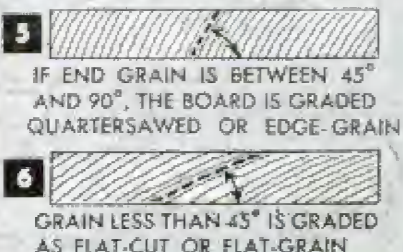
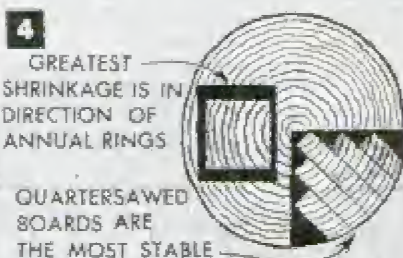
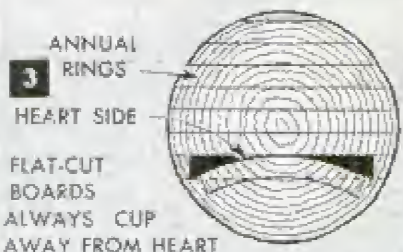


1



Can You Pick the Best Table Top?

★ TO SCORE 100 IN THIS TEST, YOU SHOULD BE ABLE TO TELL PROBABLE WARPING ACTION OF ALL BOARDS SHOWN. END GRAIN IS KEY TO SELECTION. YOU WILL KNOW WHY IF YOU READ THE STORY

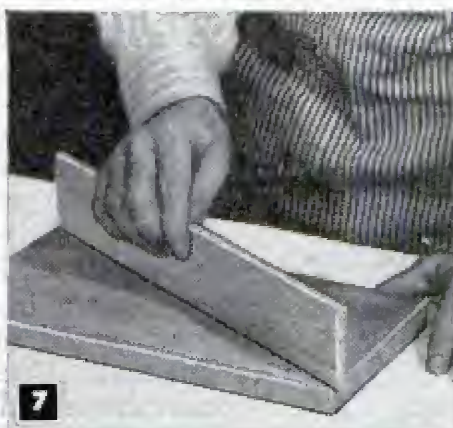


A TYPICAL FLAT-CUT BOARD — NOTE CUP WARP AWAY FROM HEART SIDE

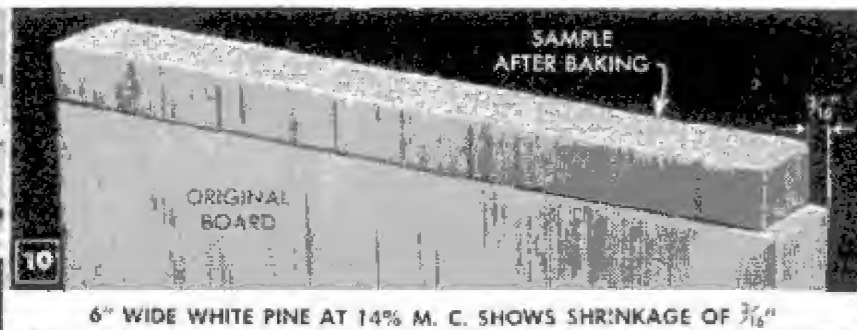
STRAIGHTEDGE IN DIAGONAL POSITION WILL TEST BOARD FOR TWIST



8



7



BAKING WOOD SAMPLE TO FIND MOISTURE CONTENT

M.C. Calculation

WEIGHT AT START 155 UNITS

WEIGHT OVEN-DRY 136 UNITS

DIFFERENCE 19 UNITS

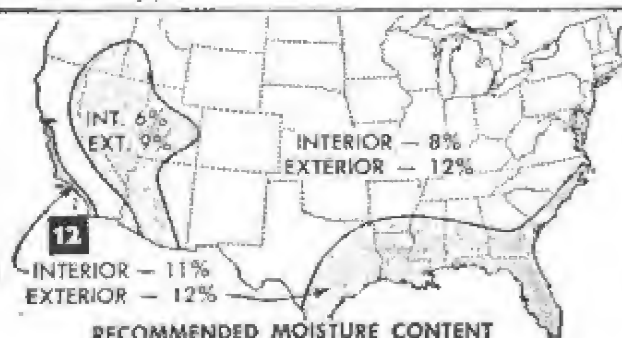
$$\frac{19}{136} \times 100 = 14\%$$

TABLE 1
MOISTURE CONTENT OF WOOD
AS AFFECTED BY HUMIDITY ①

Humidity of Surrounding Air ②	Moisture Content of Wood ③	SHRINKAGE	
		Percentage of Green Wood Size	Shrinkage in 10" Wide Board
0	0%	6.7%	$1\frac{1}{8}"$
Winter Indoors	10	3%	6.0%
	20	4½%	5.5%
	30	6½%	5.1%
Average Indoors	40	8%	4.8%
	50	9½%	4.3%
Average Outdoors	60	11½%	3.7%
	70	13½%	3.2%
Summer	80	17%	2.2%
	95 (Green)	30%	.2%

Average Seasonal Cycle
For Furniture and Woodwork

1. THIS TABLE CAN BE USED AS A GENERAL AVERAGE FOR ALL WOODS. IT IS SPECIFICALLY FOR YELLOW PINE AND DOUGLAS FIR. FIGURES ARE FOR FLAT-CUT BOARDS — QUARTERSAWED WILL RUN LESS SHRINKAGE (ABOUT 60%).
2. RELATIVE. 100 IS AIR COMPLETELY SATURATED WITH MOISTURE.
3. WOOD CONSTANTLY SURROUNDED BY AIR OF AVERAGE TEMPERATURE (ABOUT 70°) AT A CERTAIN HUMIDITY WILL EVENTUALLY STABILIZE AT A DEFINITE M. C. AS SHOWN IN THIS COLUMN. THE TIME REQUIRED FOR COMPLETE EQUILIBRIUM WILL VARY WITH KIND OF WOOD, PROTECTION, THICKNESS, ETC. (Data adapted from tables prepared by U. S. Forest Products Laboratory.)



with the humidity of its permanent location. The map, Fig. 12, shows proper M.C. for various sections of the country, based on year-round humidity. A variation of 3 percent either way is permissible. Suppose, for example, that you live in a state where the humidity is about 40 percent indoors all year round. Table 1, Fig. 11, shows that the moisture content for furniture under such conditions should be 8 percent. If the wood is 8 percent M.C. to start with, it will be stable and will shrink and expand little even during the cycle of seasonal changes.

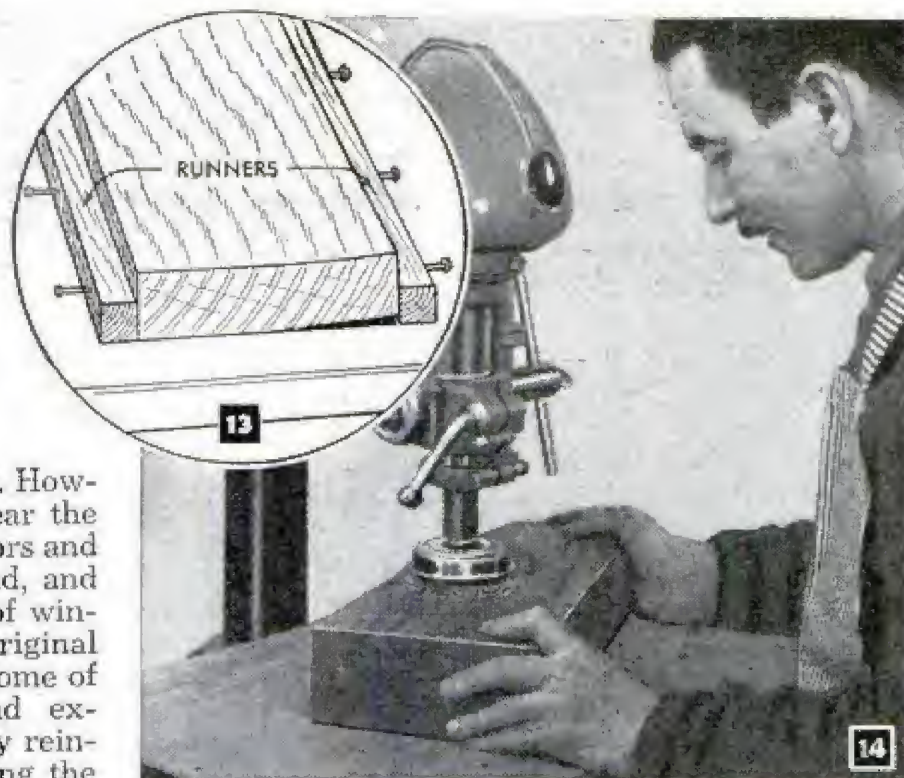
Determining M.C.: It is interesting and instructive to make a moisture-content test. Cut a strip about $\frac{1}{2}$ in. wide from the center or about 1 ft. from the end of your lumber. Weigh the sample carefully, using a small scale reading grams or grains. Place the sample of wood in the kitchen-stove oven set at 220 deg. F. and weigh it every 20 minutes until it stops losing weight. This will take about $1\frac{1}{2}$ hrs. Then, work out the calculation given in Fig. 11, and you will have the M.C. The amount of shrinkage of a test sample is graphically illustrated in Fig. 10. Although the sample is now bone dry, it won't stay that way. Within three or four hours it will regain approximately half of its lost moisture and size, and in a few weeks will be nearly normal. This verifies the fact that wood is never truly seasoned—lumber 100 years old will absorb 16 to 18 percent moisture if stored outdoors. The best place to store your wood is in a location where the humidity is about the same as where the finished product will be used. Storing for several weeks in a warm, dry location is a good conditioning treatment.

Surfacing: Warped wood must be surfaced. This job is done on the jointer if the stock is within jointer capacity; otherwise with a planer head, Fig. 14. If the piece is badly twisted, guide runners should be nailed to the edges, Fig. 13, to form a flat base for the work. In using a planer head, be sure to adjust it to take a light cut.

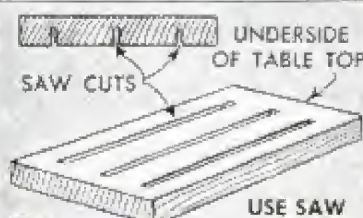
Play it safe: If you have a choice, use edge-grain instead of flat-cut lumber. At least, avoid extreme grain angles in flat-cut stock. Use a wood known to have low shrinkage and good stability, Table No. 2.

Woods marked "poor stability" often are suitable if properly conditioned. Be sure your wood is 8 percent M.C. You will note in Table 1 that if wood is 8 percent M.C., the initial shrinkage of a 10-in. board from green wood will be $\frac{1}{2}$ in. scant. The board also will be subjected to a seasonal cycle of about $\frac{1}{16}$ additional shrinkage and the same amount for expansion. However, you will note that near the end of a humid summer, doors and drawers will swell and bind, and that in the dry indoor air of winter they return to their original M.C. and work smoothly. Some of this normal shrinking and expanding can be stabilized by reinforcing and solidly anchoring the wood in assembly. Thus, if humidity is not excessive, the wood will compress within itself and follow the path of least resistance. However, if you fabricate wood having a 16-percent M.C., the strain of stabilization at 8 percent is just too much, and "pop" go your glue joints and fastenings.

Retarding warping: The end grain of stock roughly cut into turning squares and stored for future use should be given a protective coating of shellac, varnish or oil paint to prevent checking. Lumber salvaged from old furniture and resurfaced on one side only is more apt to warp than if surfaced on both sides, as freshly dressed surfaces invite rapid absorption of moisture. Furniture should be finished as soon as possible after it is completed. Linseed oil, shellac, varnish and other finishes, when applied to the surface of the wood, form a practically airtight covering through which moisture penetrates slowly. Finishing coats retard swelling and shrinking to the point that if the humidity increases 10 percent for a couple of days, there will be no appreciable change. If your wood is conditioned to 8 percent M.C., it will remain fairly close to 8 percent and you will not be troubled with warping. Ideas in Fig. 15 are worth noting in preventing warping and shrinking. Notice how cupping of a table top is avoided.

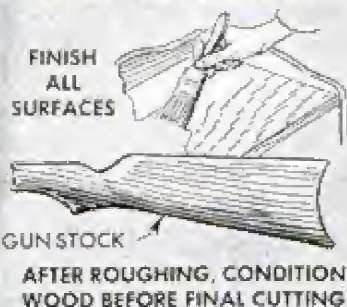
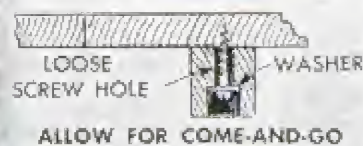
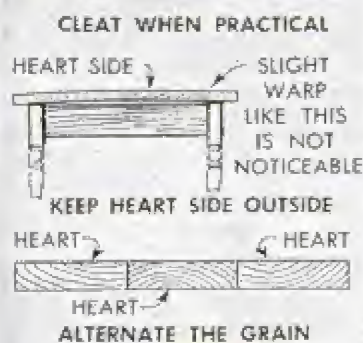


PLANER HEAD DOES CLEAN JOB OF SURFACING WARPED WOOD



Ideas to Prevent Warping

USE SAW CUTS TO RELIEVE WARPING



AFTER ROUGHING, CONDITION WOOD BEFORE FINAL CUTTING

TABLE 2 SHRINKAGE OF WOODS*			
WOOD	Shrinkage From 12% to 6% Moisture Content		General Stability
	Per-cent	In. in 10"	
ASH	1.8	$\frac{3}{16}$ "	BEST
BASSWOOD	2.3	$\frac{1}{4}$ "	GOOD
BEECH	2.7	$\frac{1}{4}$ "	POOR
BIRCH	2.2	$\frac{7}{32}$ "	GOOD
CEDAR	1.3	$\frac{1}{8}$ "	GOOD
CHERRY	1.8	$\frac{3}{16}$ "	GOOD
CHESTNUT	1.7	$\frac{3}{16}$ "	BEST
CYPRESS	1.5	$\frac{5}{16}$ "	GOOD
ELM	2.3	$\frac{1}{4}$ "	POOR
FIR (Douglas)	1.8	$\frac{3}{16}$ "	FAIR
GUM (Red)	2.5	$\frac{1}{4}$ "	POOR
HEMLOCK	1.8	$\frac{3}{16}$ "	FAIR
MAHOGANY	1.2	$\frac{1}{8}$ "	BEST
MAPLE (Hard)	2.4	$\frac{1}{4}$ "	GOOD
MAPLE (Soft)	1.9	$\frac{3}{16}$ "	GOOD
OAK (Red)	2.2	$\frac{7}{32}$ "	BEST
OAK (White)	2.3	$\frac{1}{4}$ "	BEST
PINE (Yellow)	1.8	$\frac{3}{16}$ "	FAIR
PINE (White)	1.6	$\frac{3}{16}$ "	GOOD
POPLAR	1.8	$\frac{3}{16}$ "	BEST
REDWOOD	1.1	$\frac{1}{8}$ "	BEST
SPRUCE	1.7	$\frac{3}{16}$ "	BEST
SYCAMORE	1.9	$\frac{3}{16}$ "	POOR
WALNUT	1.8	$\frac{3}{16}$ "	BEST

* FLAT-CUT STOCK. SHRINKAGE OF QUARTERSAWED WOOD WILL RUN $\frac{1}{2}$ TO $\frac{3}{4}$ OF THESE FIGURES (From Table by U. S. Forest Products Laboratory)

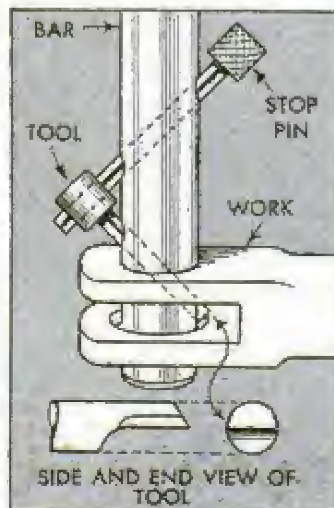
Metal Threads Polished in Lathe With Wooden Block



After threads have been given a smooth finishing cut they can be polished in the lathe with medium and fine grinding compound and a softwood block. To do this, clamp a steel rod in the tool post to serve as a rest for the wooden block and apply the grinding compound to the thread. Turn on the lathe and press the block against one end of the thread, working toward the other end so that the thread will form a corresponding thread in the wood. Repeat the operation until the thread is thoroughly polished.

Special Tool for Internal Chamfering

Chamfering the inside edge of holes in a yoke or other slotted work is practically impossible with an ordinary boring bar, especially when the space between the holes will not permit adjustment of the bit. However, with this boring tool the bit can be set easily from the outside of the work. This is done by drilling holes diagonally

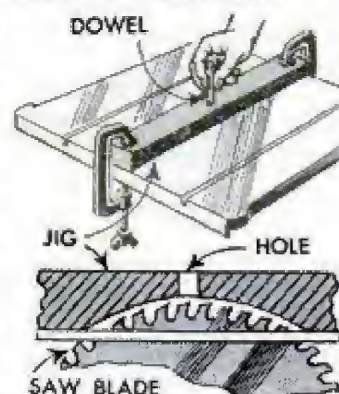


from opposite directions to take the tool bit and a stop pin. Both are almost alike, except that the tool bit is ground for a cutting edge and its head is drilled through for the end of the stop pin. In use, the boring bar is advanced through one hole, the tool bit inserted in the boring bar and

locked in place with the stop pin. It takes little time to set the bit as the stop pin automatically locates it in position. The chamfering is done in the usual way by advancing the boring bar until the desired depth is reached. A new setup must be made each time for holes of varying size.

Mass-Producing Slotted Dowels

After giving considerable thought to speeding up a dowel-slotting operation in my shop, I used this simple jig which has increased production many times. The jig was made by slotting a piece of wood to clear

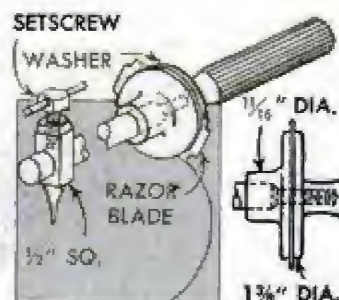


the saw blade when it is set for the desired depth. Then, I drilled a hole, having a diameter slightly larger than that of the dowels, through the top of the block, so that when the jig is in place, the hole is centered directly over the saw blade. The jig is held to the saw table with C-clamps. With the blade rotating, I merely press the dowels down through the hole.

R. F. Klemowicz, Camden, N. J.

Razor-Blade Gasket Cutter

A handle from a discarded safety razor and a double-edged blade are integral parts of a circular-gasket cutter that provides four interchangeable cutting edges. The cutter is made by turning and threading the end of a $\frac{3}{8}$ -in. iron rod, about 13 in. long, to fit the razor handle. Next, a flange is machined as shown, and counter-bored to take the shouldered and threaded end of the rod. The razor blade is clamped between the flange and a metal washer by screwing the handle on the rod and tightening it against the washer. A pointed center post, which is drilled to slide over the other end of the rod, is fastened with a setscrew. The cutter is used by adjusting it to the desired radius of the gasket and holding the center post with one hand while pulling the cutter around with the other hand. Avoid possible injury by covering the edge of the razor blade which projects at the top of the flange with two or three layers of adhesive tape.





Lightweight FM Handie Talkie

WEIGHING only 8½ pounds, this brief-case size portable FM transmitter and receiver may be carried in the hand, on the shoulder, or as a back pack. Utilizing a superheterodyne circuit of high sensitivity and stability, it will provide reliable two-way communication in excess of two miles between units.

Photos A, C and D show practical applications where this means of on-the-spot communication serves to save time and protect property and lives. Railroad men can now expedite freight in busy yards under any weather or lighting condition. Fire fighters can dispatch orders to pump operators a block or more away, and the fire marshal can radio impending danger to firemen inside or behind a building. Many other applications include ship-to-shore communication. The top section of the portable unit, photo B, houses the combination Motorola transmitter and receiver which employs 11 sub-miniature tubes in the receiver, and 7 in the transmitter; a lower section holds portable-type dry batteries. When carried by hand or on the shoulder, a push-to-talk handset is employed; a lapel microphone with ear plug is used when the unit is carried on the back. Designed to operate in the 25 to 44-megacycle band, transmission range between units varies depending upon local conditions of terrain and noise.

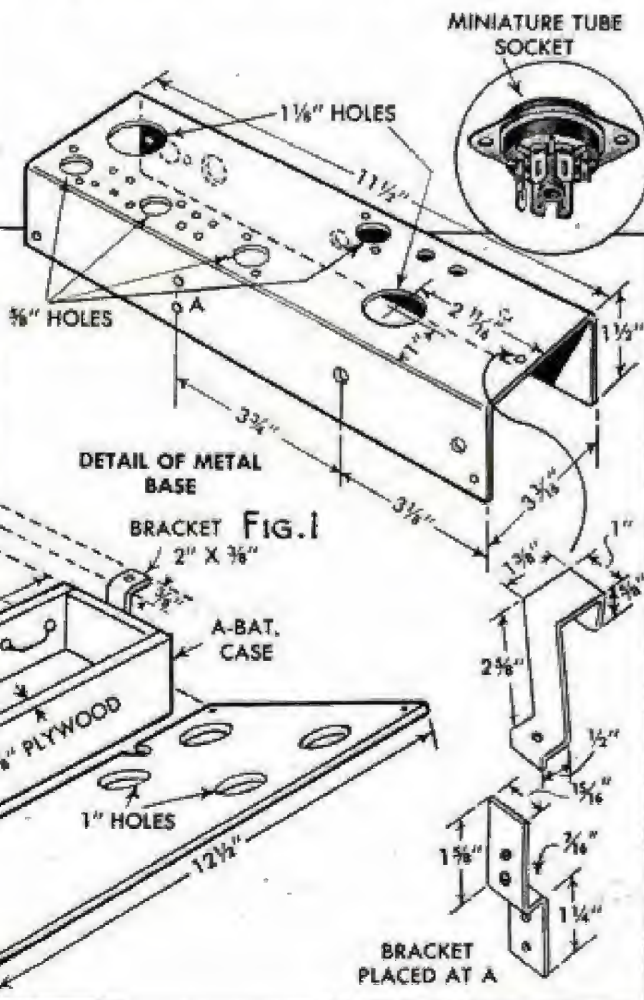
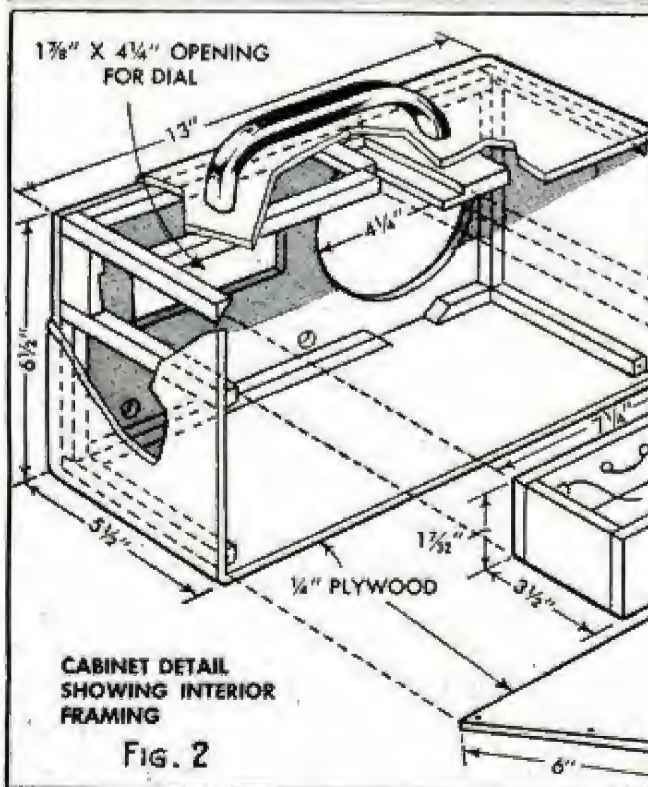
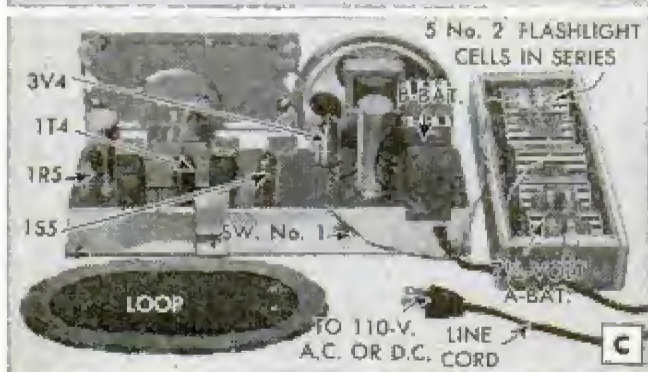
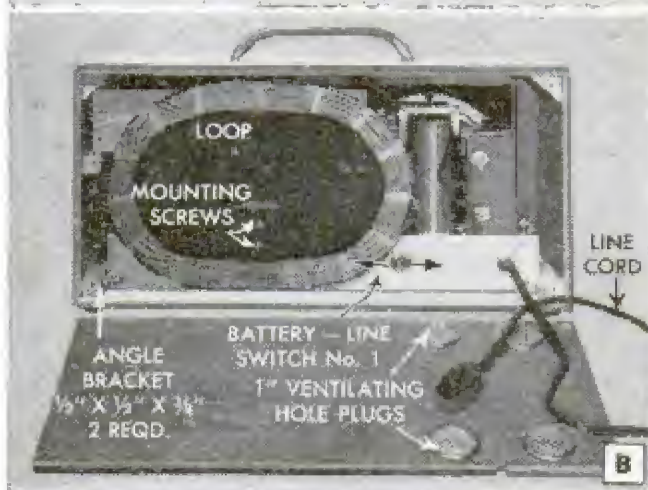


THREE-WAY FOUR-TUBE

By Milo A. Adler

FULL 5-tube performance is obtained with this 4-tube versatile portable receiver because no rectifier tube is employed. A 100-ma. Federal selenium 5-plate rectifier converts a.c. to d.c. when operating from 110-volt lines. The switching circuit from battery to a.c.-d.c. operation is quite simple. It is done by means of a double-pole, double-throw toggle switch located on the rear of the chassis base. No special parts are used and all the components are available from radio parts houses for this compact 3-way portable vacation receiver.

Although not designed for beginners, construction is not difficult if the builder uses care in placing the major component parts in the proper positions on the base so that all leads may be kept as short as possible. The miniature I.F. transformers are provided with color-coded lugs on the bottom. A red dot indicates a "B plus" connection, a blue dot the plate, a green dot the grid or diode-plate connection. A black dot identifies the ground or AVC terminal lug. The miniature tube sockets are 7-pin Amphenol No. 147-500 type. A metal shell



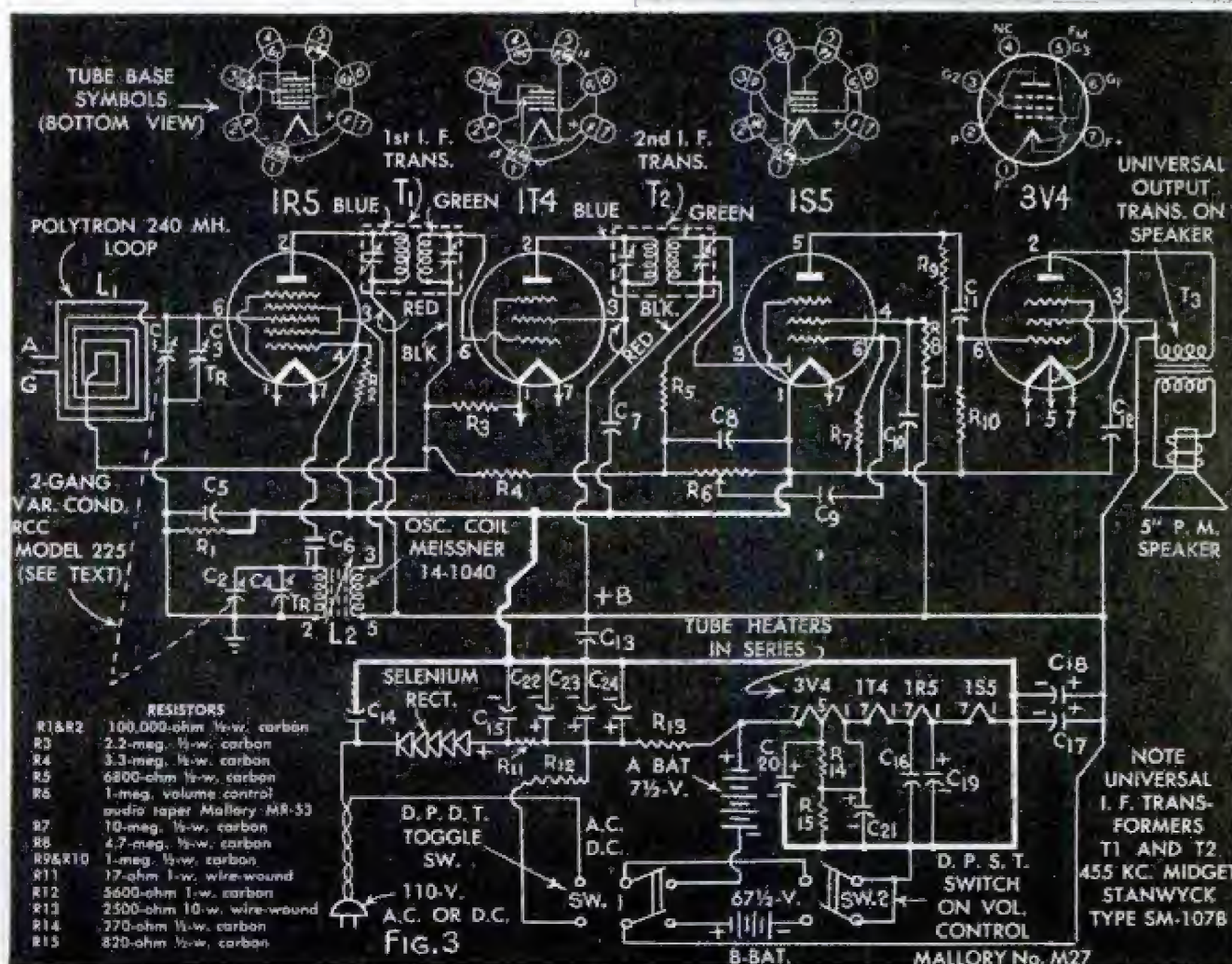
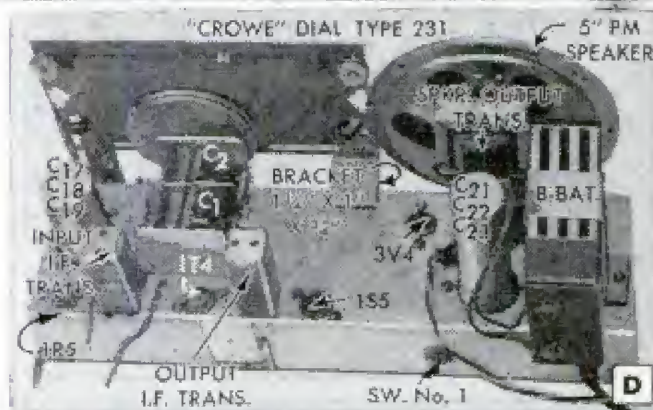
PORTABLE VACATION RECEIVER ★ ★ ★ ★ ★



in the center of each socket acts as a shield and may be used for a common ground tie point. The $\frac{1}{16}$ -in. sheet-aluminum chassis base is detailed in Fig. 1. This base is quite simple and may be formed over a block of wood clamped in a vise. The brackets are cut from the same material. Photos A, B, C, D and E show various views of the completed set.

Wire the filament circuit and filament

(Continued to page 226)



LARGE-SCREEN TELEVISION

By F. L. Brittin

THEATER television in which the screen image is approximately equal to that of present-day movies in size and brilliance has been demonstrated with an experimental large-screen television projector in the laboratories of the RCA Victor Division. Based on the highly efficient Schmidt-type optical system used by astronomers for astrophotography, this reflective optical system, adapted by RCA engineers for projection TV systems, collects the light rays from a comparatively small picture tube and directs them to the screen, properly focused. In home television sets this system provides 15 by 20-in. pictures. Now greatly enlarged, this same optical system makes possible bright, clear pictures of high quality that fill an 18 by 24-ft. theater screen, as illustrated in photo A.

Photo B shows the high-intensity cathode-ray tube being inserted in the large-screen projector. The optical system in this projector employs a 42-in. spherical mirror and a 36-in. aspherical correcting lens. The projection distance, or throw, is 40 feet. The magnifying power of the spherical mirror is illustrated in photo C; engineer I. G. Maloff holds the cathode-ray tube. The aspherical correcting lens compensates for natural errors in the spherical mirror, thus insuring clear picture images on the final viewing screen. The shape of the lens is such that the light rays coming from any point on the inner face of the projector kinescope (cathode-ray tube) will, after reflection, be optically forced to converge at a single point on the viewing screen. This action is illustrated in Fig. 1 by light rays 5, 6 and 7 which all originate at the same point on the picture-tube face.

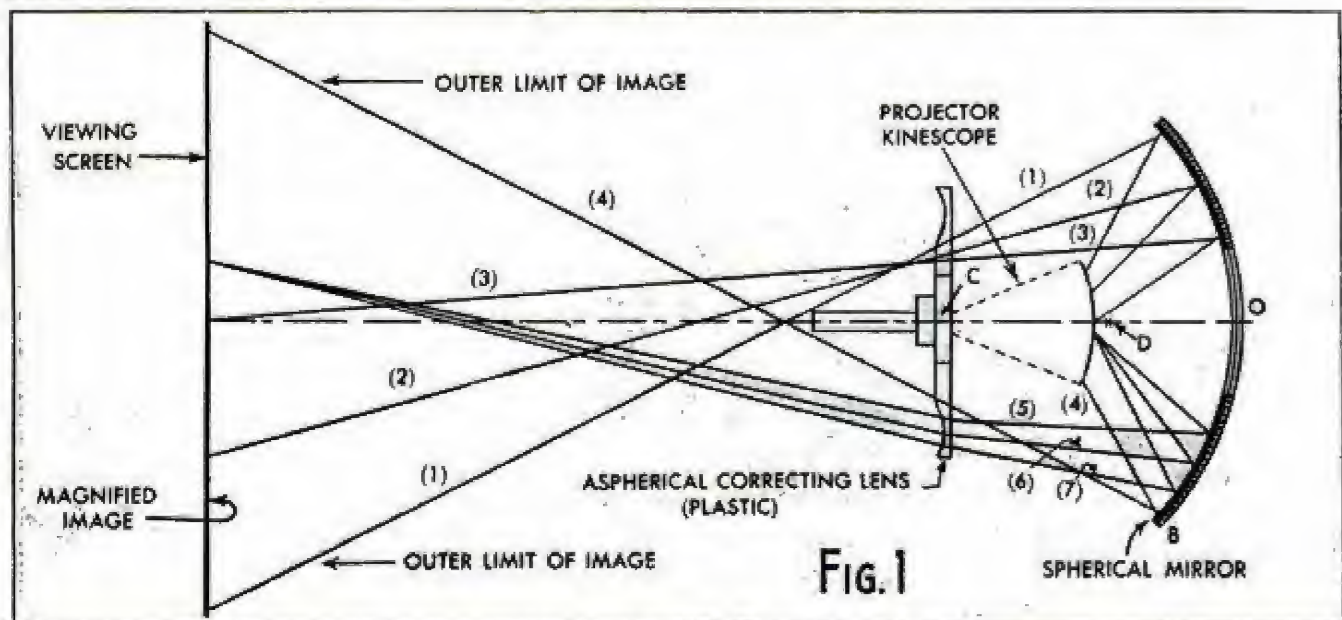
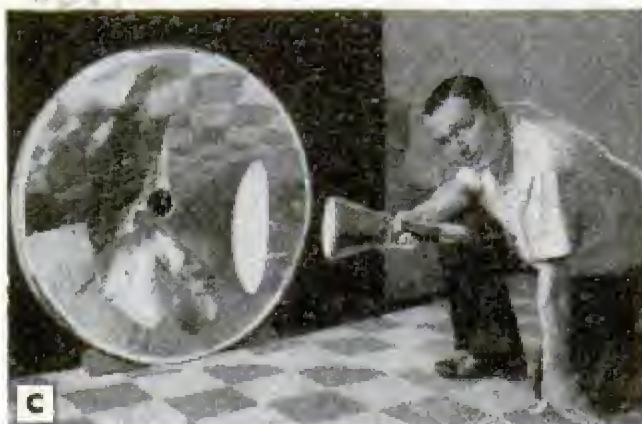


FIG. 1

PUT **SNAP** AND **SPARKLE** IN YOUR NIGHTTIME PICTURES

KODAK VARI-BEAM STANDLIGHT



Wide beam for general still work

Moderately narrow beam for your movies.

Extra narrow beam for glamour shots

FEATURES

12-INCH REFLECTOR . . . with No. 2 Photoflood lamp, gives powerful illumination.

FIRM STEEL BASE . . . 4½ pounds, has special rubber rim for protecting furniture and floors.

TELESCOPIC COLUMN . . . easy to adjust lamp for any height from 3 to 5½ feet.

CONVENIENT HANDLE FOR AIMING LAMP . . . clamping knob quickly adjusts tension.

Price—\$15

KODAK VARI-BEAM CLAMPLIGHT—

Lamp unit has all the features of the Vari-Beam Standlight unit, but is mounted on flexible bracket. Padded clamp attaches quickly and securely to chair backs, table tops, and tubular surfaces.

Price—\$9.75

KODAK PHOTO FLASHER—

Brilliant indoor flash pictures are easy to take with this self-contained unit. Specially designed for any camera with "time" or "bulb" setting. Simply open shutter . . . shoot the Flasher . . . close the shutter, and you have the picture.

Price—\$1.25 (plus tax)

"Kodak" is a trade-mark
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to change
without notice

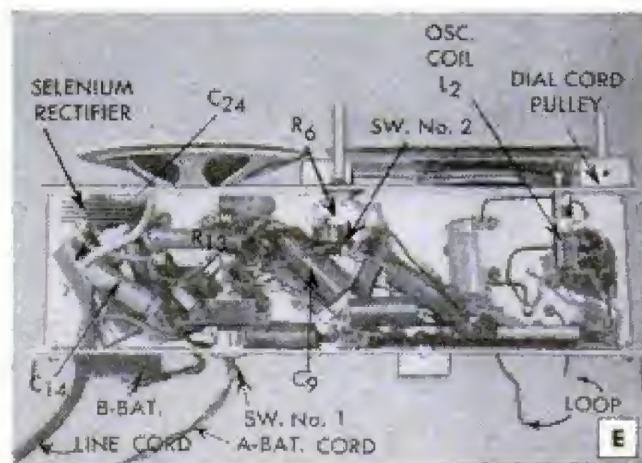
Kodak

Portable Vacation Receiver

(Continued from page 223)

CONDENSERS (Fig. 4)

- 1—Two-gang variable condenser with cut-plate oscillator section Radio Condenser Corporation model 225, type CN825171 C1, C2 and trimmers C3, C4
- 6—.05-mfd. 400-v. paper-type condensers C5, C10, C13, C14, C15 and C16
- 1—50-mmfd. mica-type condenser C6
- 2—100-mmfd. mica-type condensers C7 and C8
- 2—.01-mfd. 400-v. paper-type condensers C9 and C11
- 1—.005-mfd. 400-v. paper-type condenser C12
- 1—Mallory-type FP302 electrolytic condenser unit: 15-15 mfd. 150-v. C17 and C18; 1000-mfd. 2-v. C19
- 1—50-mfd. 25-v. electrolytic condenser C20
- 1—Mallory-type FP309 electrolytic condenser unit: 100-mfd. 25-v. C21; 50-mfd. 150-v. C22; 30-mfd. 150-v. C23. Note—both Mallory units have 3 sections
- 1—50-mfd. 150-v. electrolytic condenser C24



supply first, and keep all wiring short and as close to the chassis as possible. Leave the tubular paper condensers and resistors until all other wiring is completed. The schematic circuit diagram appears in Fig. 3. Use No. 20 or smaller hookup wire and rosin-core wire solder for the circuit. As the terminals on the tube sockets are small and may require several connections, care must be taken in soldering. Be careful that excess solder does not run down the terminals, touch another terminal or the chassis to cause a short. Always connect the outside foil of paper-type condensers to common ground when they are used as screen by-pass or AVC filter condensers; for fixed condenser values see Fig. 4. The Crowe dial comes with complete instructions for stringing the dial and cutting the panel hole in the cabinet. Complete details for the cabinet and A-battery case are given in Fig. 2. The cabinet is constructed of 1/4-in. plywood and strips of 1/2 by 1/2-in. pine. All

(Continued to page 228)

5 GREAT MODELS

Model HD	Small Alternate Firing Twin	2.5 H.P.
Model TD	Medium Alternate Firing Twin	5.0 H.P.
Model KD	Large Alternate Firing Twin	9.8 H.P.
Model SD	Super Alternate Firing Twin	16.0 H.P.
Model PO	Heavy Duty Opposed Twin	22.0 H.P.

All ratings are OBC Certified Brake H.P. at 4000 r.p.m.



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MODEL TD

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A small section of the surface of an average car magnified 20 times. The left side is shown still covered with Traffic Film. The right side has been cleaned with Du Pont NO. 7 POLISH.

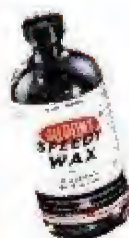
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ADDRESS

CITY.....STATE.....

joints are glued and nailed with brads. The cabinet is given a thin coat of shellac, then stained any desired color. The final finish coat is a flat lacquer which is later polished with a heavy coating of paste floor wax. The handle is a dime-store chrome drawer pull. The A-battery case must slide easily in and out of the cabinet to prevent injury to the dial mechanism. Five 1½-volt No. 2 flashlight A-batteries are connected in series either by directly soldered connections, or phosphor-bronze spring clips, if preferred. To change the A-batteries, remove the two control knobs on the front and the two small angle brackets at the back of the chassis and pull the receiver partially out of the cabinet. Have the A-battery leads long enough to remove the case and be careful that they do not short on the chassis or any other wires or terminals in the set. Snap-clip leads are used on the 67½-volt B-battery. All tubes must be in their sockets when this set is operated on the 110-volt line. The A and B-batteries need not be in place but tape their leads to prevent shorts. To place the set in operation, throw switch No. 1 to the position for the type of power used and then turn on switch No. 2. The set will begin to play as soon as a station is tuned in. Very little adjustment of the I.F. transformers is required as they are pre-tuned at the factory. Tune the set to a station at about 600 kc. and adjust the I.F. trimmer condensers for maximum volume. Loosen the dial drum on the variable-condenser shaft and move the dial pointer so that it reads the frequency of the station tuned in. Now tighten the dial drum and tune in a station at about 1400 kc. and check the frequency of the station on the dial. If it is not correct, adjust trimmer C4 on the 19-plate 170.7 to 8.7-mmfd. oscillator section C2, until the reading is correct. The oscillator coil has a powdered iron-core slug that will now have to be adjusted with a small screwdriver to secure the proper dial readings in the middle of the dial. These last adjustments may have to be repeated several times to insure proper tracking over the entire dial. Finally adjust trimmer condenser C3 on section C1 of the 2-gang condenser for maximum volume, the capacity of the 27-plate section C1 is 431 to 11 mmfd. Terminals A and G on the loop antenna are for external antenna and ground connections if required in remote locations. Two short machine screws are used to mount the loop on the rear chassis bracket. Detailed student material list R-367 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage.



**LET YOUR SEALED POWER
FRANCHISED DEALER HELP YOU**

GET THAT "NEW-CAR FEEL" AGAIN!

NOW—after a hard winter—have your Sealed Power Franchised Dealer give your engine a thorough check-up. He can help you get that NEW-CAR FEEL again, right now! And you will get more mileage on gas and oil.

You remember when that car was new—how you thrilled to that surge of eager power. That's the NEW-CAR FEEL. Let your Sealed Power Dealer restore it to your old engine.

He has a set of Sealed Power Piston Rings specifically engineered to do the best possible job in your engine, whatever the make, model or cylinder wear condition. When he in-

stalls new Sealed Power Rings and overhauls your engine, you will know that NEW-CAR FEEL again—and new-car operating economy, too!

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Send a postal for illustrated, informative new booklet on 7 ways to save oil. It's free and may save you real money. Sealed Power Corporation, Dept. G6, Muskegon, Michigan. In Canada: Stratford, Ontario.

Your Sealed Power Franchised Dealer also handles Sealed Power Pistons, Cylinder Sleeves, Valves, Water Pumps and Chassis Parts.

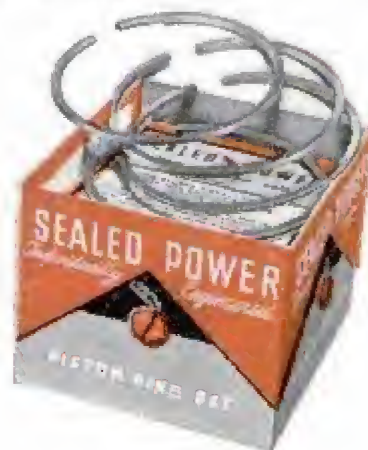
Sealed Power
PISTON RINGS

BEST IN OLD CARS!

BEST IN NEW CARS!



© Sealed Power Corp. 1948



**"That hammer?
You're kidding!"**



FRED: It's a fact, Bill. I've been using this same hammer for 29 years. It helped to build the house you were born in.

BILL: Well, I don't know how you do it. I hardly ever *use* a hammer, and yet I've broken two of them in the last year or so.

FRED: That so? What kind of hammers were they? What brand, I mean.

BILL: Gosh, I don't know. Guess they didn't *have* any brand names. But they were good bargains.

FRED: That's where the trouble is, Bill. Look . . . see the name on this hammer? Whenever you see that brand name, you

know it's a good hammer. Stick to the well-known, advertised brands when you buy tools, and in the long run you'll save a lot of money.

BILL: That makes sense, Fred. I'll remember it.

FRED: And do your buying at the hardware store, where they don't try to sell you anything but quality tools. That way you'll always get your money's worth.

*Your HARDWARE DEALER sells QUALITY tools
and hardware... Buy from HIM*



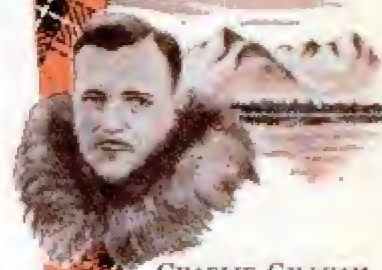
POPULAR MECHANICS

"Raw North proves Scott-Atwater reliability..."
says Charlie Gillham, Arctic Explorer

"Since coming to the Arctic, my Scott-Atwater has always been on the job. Starts right off the bat. Runs all day long without a sputter. A motor in the Arctic takes a terrific beating from extreme temperatures, severe storms and salt water, but Scott-Atwaters really stand up!"

Yes! And Scott-Atwater owners in 48 states and 37 foreign countries confirm Charlie's hearty endorsement of Scott-Atwater's reliability.

Backed by the superior production machinery and years of experience that made Scott-Atwater one of the world's largest producers of outboards, Scott-Atwater motors introduce standards of precision and dependability normally found only in aircraft engines or fine automobiles. For a new experience in outboard motoring, take Charlie Gillham's advice. See the new 1948 Scott-Atwater at your dealer's now.



CHARLIE GILLHAM
 Arctic Explorer,
 hunter, fisherman,
 author of the
 current best seller,
 "Raw North".

Two Great New Motors

Scott-Atwater 1-12 AND 1-20

A New Experience in Outboard Motoring!

Scott-Atwater's sensational performance is the result of a unique combination of advanced engineering designs. ✓ Multiple Feather Valves automatically change timing to admit optimum fuel charge at all speeds. ✓ Full Expansion Exhaust reduces back-pressure to an absolute minimum. ✓ New Type Magneto shoots hot spark for one-pull starting. ✓ High-Pressure Water Pump gives 60% more circulation for ever-cool trolling. These features produce a motor which will start with one short pull (8 inches will do it!), idle down to "nothing" (a mile an hour), speed up to 12 or 20 miles an hour (depending on model).

You'll like Scott-Atwater's all-weather, bother-free reliability (see below), as well as its "ABC" simplicity and distinguished styling. Best of all, though, your dollar buys more OBC Certified Horsepower in a Scott-Atwater. Look in the Yellow Pages of your phone book for the name of your nearest Scott-Atwater dealer or write Dept. PM68 for illustrated literature.

One mph trolling
 Twelve mph top speed

One mph trolling
 Twenty mph top speed



Super-Sealed Lower Unit—New brass encased grease seal impregnated with synthetic rubber keeps grease in, water out. Check twice a year.



All-Weather Operation—Lightweight aluminum skirts protect carburetor and ignition from the elements. Magneto fully enclosed and water-proof. Dependable in heavy rain and high waves.

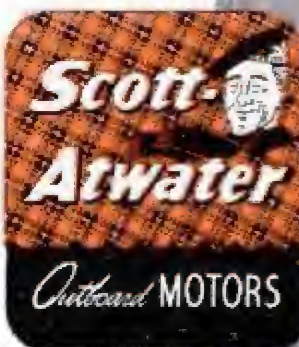


Super Fuel Filter—Scott-Atwater's new porous metal filter keeps all foreign matter, even water, out of fuel system. New type swivel gas cap swings out of way. New type magneto keeps spark plugs clean all season.



Steel Connecting Rods—Scott-Atwater's drop-forged connecting rods are virtually unbreakable. 24 roller bearings on crank pin. Heat-treated lynite aircraft pistons.

Scott-Atwater 1-12
 Deluxe Single
 with Auto. Recoil
 Starter, 3.6 h.p.
 (OBC Certified
 @ 4,000 rpm).
 Also available,
 Scott-Atwater 1-20
 Deluxe Alternate
 Firing Twin, 7½ h.p.
 (OBC Certified
 @ 4,200 rpm).



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**Solves many other
woodworking problems
in seconds**

only 10¢

Easy to use. Fast . . . simply set dial of GREENLEE Handy Calculator to get measurements; slope per foot in degrees; comparative hardness, weights and workability of various woods; bit sizes; nail specifications; tool sharpening hints. 6" diameter heavy varnished cardboard. Special offer by maker of famous GREENLEE tools. Send 10¢ to Greenlee Tool Co., 2106 Columbia Avenue, Rockford, Illinois.

TOOLS FOR CRAFTSMEN
GREENLEE



Lion Hunt

(Continued from page 165)

It takes a smart hunter to trap a mountain lion. Usually the animal ranges back and forth over the same territory and develops a route that takes about a week to cover. The trapper tries to learn the lion's schedule and then starts one day ahead of him, setting several traps on the trail that the lion uses. Heavy bear traps that can break a man's leg are most often used, placed under a barricade. Other animals will jump the barricade but the cougar usually slinks under it. The trapper posts signs to warn humans of the traps.

The trick in making a good set is to use a trowel to dig the hole, scooping the displaced earth onto a ground cloth. This avoids disturbing the natural appearance of the surroundings. The smart trapper, of course, wears gloves to minimize the odor he leaves. Instead of attaching the trap to a stake most trappers chain it to a small grappling hook and a heavy weight. The hook will catch in the brush and hold. All displaced earth is carefully sifted over the buried trap with just enough dirt on top to conceal the trap. Catnip oil or some other scent is used as the lure.

The lion is the biggest predator of the West, but the coyote and the bobcat are even more destructive because of their numbers. Bobcats are members of the lynx family. They take large numbers of game birds, and both bobcats and coyotes kill fawns and calves. Coyotes also do considerable agricultural damage, especially to fruit crops. They live on cultivated grapes for weeks at a time, destroy tons of ripe watermelons in the field by taking a bite out of each, and climb into the branches of low trees to eat or damage the fruit.

A good professional trapper can expect to average one coyote a day and from 50 to 150 bobcats per year when working in territory that hasn't been heavily trapped. Some 4000 coyotes and 1200 bobcats are trapped in California each year.

Sternwheelers Still Rule the River

(Continued from page 96)

have to get help from other tugs to swing a big ship in these currents. But a sternwheeler's different. With her seven rudders she'll twist a liner around in a bathtub. Even if she's dead in the water (fully stopped), you still have rudder power because the paddles still push water against some of the rudders—even in reverse!"

The two skippers explain how important

(Continued to page 238)

LOOK AT ALL THE JOBS MULTI-TOOL WILL DO FOR YOU

Trade Mark Reg.



A
CONTINENTAL
Red Seal
PRODUCT

Multi-Tool is the portable, self-contained, power source that will drive a wide range of machines and shop tools. Controlled speed range of 100 to nearly 10,000 r.p.m. is available on pulley-and-belt drive, and 1,600 to 2,600 r.p.m. on direct drive. Any machine or tool needing up to 1 1/2 h.p. can be driven by Multi-Tool. Write for literature. See how Multi-Tool will save you time, money, labor.

FOR A HUNDRED AND ONE JOBS

Simply take Multi-Tool to the job—wherever it is. ONE Multi-Tool will run dozens of different machines—cut equipment costs—eliminate drudgery. Use it for grinding, drilling, sawing, and for running feed grinders, corn shellers, cement mixers, forges and dozens of other uses.

Portable

Multi-Tool is easily carried. Has easy-grip hand hold at either end.



IN THE SHOP
Drives lathes off belt, run drills off flexible shaft at same time. Special utility base and grinding head available.



POWERS MANY MACHINES
Cement mixers, corn shellers, pumps, and many other farm machines usually run by hand can be easily driven by Multi-Tool.



STAND BY POWER
When line power fails, Multi-Tool can operate generator or can be belt connected to pumps, milking machines, etc.

This compact power source is reliable, easy starting, modern in every way. Operates for a few cents an hour. Three-step pulley integral with Multi-Tool automatic transmission.

SPEED CONTROL. Fingertip dial permits you to select speed you need for any job, and Multi-Tool will hold to that speed. Automatic transmission permits engine to idle while you change tools or belts.

Up to 1 1/2 h. p., Multi-Tool will do dozens of jobs for you. Get literature today.

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**SCREW-STEM FILTER
PIPE for \$1**

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FILTERWELL
With *Ajustomatic* Stem

AJUSTOMATIC STEM NEVER
LOCKS OUT OF LINE
FILTER ABSORBS
TARS & JUICES

IMPORTED BRIAR

Never before a screwstem pipe with all these features: patented free-turning self-aligning Ajustomatic stem—an easy-to-replace Filter—choice of smart styles in fine imported briar—and a low, low price making it the best buy in pipe history! At Better Stores . . .

\$1

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THE NEW

MONARK
Super Deluxe

Dream bike of the century! Super streamlined "air flow" design with new "Air-Wing" head shield and dozens of other exciting new features. New mar proof and chip resistant finish. For sale by better dealers everywhere.

MONARK SILVER KING, INC.

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Send Free Folder B-63 showing complete new Monark line in full color.

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Which of these new drills catches your eye?

Which of these slick new hand-drills would you like to have at your work-bench right now? Both have that clean, solid *look* of a good tool that any craftsman recognizes. Hard to choose between them? Why deny yourself either one, when you can own *both* for so little! They're the finest looking drills we've ever made, released now to celebrate Millers Falls' 80th Anniversary. At your hardware store.

Machine-cut gears; "Oilite" spindle bearing with ball thrust; true-running 1/4" chuck with 3 hardened jaws. Easy-grip plastic handle holds 8 standard points (1/16" to 11/64").



Millers Falls
1/4" HAND DRILL
#104 \$5.00

Slightly higher
in the west.
Complete with
8 drill points.

Millers Falls
AUTOMATIC
DRILL
#100 \$3.50

Slightly higher
in the west.
Complete with
8 drill points.

Exposed metal parts nickel plated steel and buffed aluminum. Right-tension spring gives quick handle return. Eight drill points (1/16" to 11/64") in rugged plastic handle. Dial the drill you want, and out it drops.

Millers Falls Tools



Millers Falls Company • Greenfield, Mass.

Celebrating 80 Years of Toolmaking

Clinic



for Homemakers

As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Condensation in Gas Hot-Water Heater

Q—My gas hot-water heater is installed in the kitchen and vented to the chimney with a 4-in. vent pipe. When the heater is on the pipe sweats and drips water. Can you explain and tell me how to correct this trouble?

V. D.—Chicago.

A—One of the products of combustion is water vapor. This condenses on the surface of the vent pipe which is cooler than the gases passing through it. Usually pitching the horizontal run of pipe at a steeper angle cures this trouble.

Removing Enamel From Wall

Q—I want to remove enamel from one wall of my bathroom. I tried a paint remover but when brushed on, this runs down the wall to the floor and does not soften the enamel. How should I do this?

R. M.—Seattle, Wash.

A—Paint removers are made in both liquid and paste forms. The latter is a fairly heavy paste and is made especially for removing paints and enamels from vertical surfaces. Apply with a wall scraper or a wide wooden paddle and be sure that you cover the surface uniformly. Allow the remover to work for 10 to 30 minutes, then scrape off with a beveled scraper. The softened enamel will come off with the remover. Where there are several coats, two or more applications of remover will be necessary.

Seeding a Lawn Terrace

Q—For two seasons I have tried unsuccessfully to seed a terrace across the front of my lawn. During a heavy rain both soil and seed washed away, leaving the slope ridged and gullied. I filled and leveled the slope with new soil and reseeded, rolling the seed bed after seeding to pack it. The same thing happened again. I would like to retain the terrace if possible, but how can I get grass started on this slope?

C. A.—Cleveland, Ohio.

A—There is an open-mesh fiber matting available, which is made especially for holding soil on lawn terraces. Prepare the soil on the terrace slope and seed it in the usual way. Then cover the seeded area with the matting, making sure that it is laid flat, without wrinkles or folds. Roll immediately, using a light roller, its weight not exceeding 75 lbs. This will press the matting into the surface sufficiently to hold it in place. The coarse mesh of the matting will hold both soil and seed on the slope until the latter germinates and strikes root. Do not remove the matting. Simply leave it in place as it will slowly disintegrate.

(Continued to page 236)

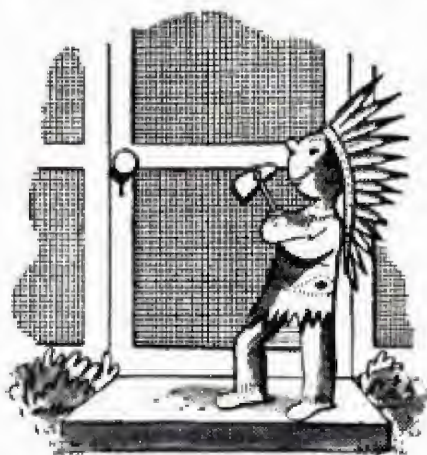
Now-A New Kind of Screening

**STAINPROOF-RUSTPROOF
-LASTS A LIFETIME**



Tough

Here's the screen you would never have believed possible . . . that always stays taut and firm! Punch it, bump it, lean on it—it gives—then snaps right back when mounted properly. Lasts as long as your house,



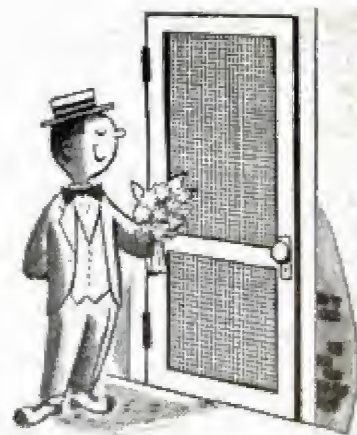
Different

Made from saran plastic, the fibres of this amazing material give LUMITE qualities never before imagined in an insect screen. Imagine—if you can—a screen completely unaffected by water sun, smoke, soot, acid fumes, or salt spray. That's LUMITE! Sold by leading Hardware, Lumber or Building Supply dealers

Screen once and for all with

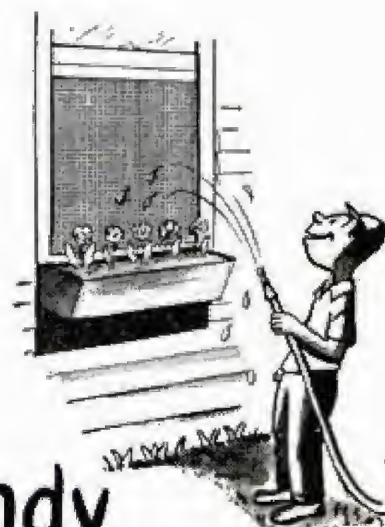
LUMITE*

Woven of saran



Handsome

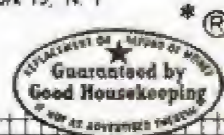
Good looks are just a part of this amazing new screen material. Because it is absolutely rustproof . . . corrosion proof, LUMITE can never stain the sills or side-walls of your house—never become ugly-looking or discolored.



Handy

Perfect for the man-about-the-house, LUMITE is the no-upkeep screen. It never needs painting or any protective coating. It's amazingly easy to handle—you can cut it with ordinary scissors . . . no special tools. No scratched fingers.

For information and free sample
write Dept. 52, Lumite Division
Chicopee Manufacturing Corporation
47 Worth Street, New York 13, N. Y.



is a "must" in saw sharpening



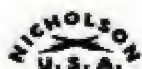
NUMBER OF SAW
POINTS PER INCH

USE

5	7" REGULAR TAPER
6	7" or 8" SLIM TAPER
7	6" or 7" SLIM TAPER
8	7" EXTRA SLIM TAPER; 6" SLIM TAPER; or 8" DOUBLE EXTRA SLIM TAPER
9	6" EXTRA SLIM TAPER; or 7" DOUBLE EXTRA SLIM TAPER
10	5" or 6" EXTRA SLIM TAPER

In filing a handsaw, two things are important toward making it "zing" through the wood true and fast: The file must be the *right size* and a *good brand*. The table above tells you about the sizes. The trade-marks below tell you the brands widely considered *best in the world*.

Count the teeth per inch in your handsaws, band saws, miter saws; take the table with you to your hardware dealer; ask for Nicholson or Black Diamond brand—and equip yourself with the most efficient saw-sharpening files you've ever used! *Free booklet*, "File Philosophy," tells about saw filing and about files in general.



NICHOLSON FILE COMPANY
22 Acorn St., Providence 1, R. I.
(In Canada, Port Hope, Ont.)



NICHOLSON FILES

FOR EVERY PURPOSE

Drilling Holes in Plaster

Q—I need to drill several small holes in a plastered wall. I tried several methods but the plaster cracks and chips each time near the hole. How should I do this?

G. B.—Brooklyn, N. Y.

A—The simplest method is to cut the head from a small finishing nail which is slightly smaller than the diameter of the hole required. Hold the pointed end of the nail on an anvil or other metal surface and flatten it slightly with a light hammer blow. Drive this improvised drill with a hand drill, working slowly until the drill point breaks through the finish coat of plaster.

Removing Whitewash

Q—I want to remove whitewash from a masonry wall and from the wooden posts of an ornamental fence. The wall has been whitewashed several times and the coating is quite thick. What will take it off?

J. R.—Dallas, Tex.

A—Soak the whitewash with a solution made by dissolving 1 lb. of potash in 10 quarts of water. A thorough application of this solution will soften the coating so that it may be removed quite easily with a scrubbing brush or a worn broom. Use a long-handled cloth swab to apply the remover to the whitewashed surface.

Removing Soot From Chimney

Q—We have two chimneys which seem to become clogged with soot, requiring cleaning out every two or three weeks. One chimney is lined with 6-in. round flue liners. Flue size of the other is 7 by 15 in. What is causing this trouble and how can we remedy it?

P. V.—Batavia, Ohio.

A—There are various soot removers available which are quite effective in removing soot accumulations from chimneys and flues. However, we assume from the way you describe the problem that there is something wrong with the draft, that is, somewhere along the column of hot gases passing up the chimney there is an eddy which causes soot, fly ash, and other larger particles to accumulate rapidly. This may be due to some peculiarity of the flue construction. The type of flue which is built into the masonry or brick walls of some older homes frequently gives this trouble, especially where the stovepipe opening is only a few inches above the bottom of the flue. Also, an exposed chimney, which cools rapidly when the fire is checked, favors the deposit of soot in quantity. We think it would be a good idea to investigate these possibilities. One of the best and cheapest ways to remove soot deposits (not fly ash, which is another by-product of combustion) is to place a quantity of granulated rock salt on a hot bed of coals and immediately open all drafts so that the fumes are carried up the flue. This must be done often during the season. Use a pound or more of the salt for each treatment.

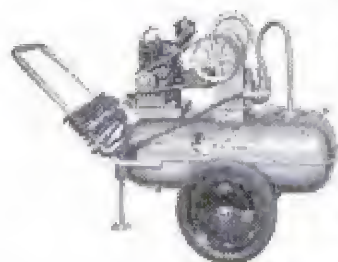
Cause of Paint Failure

Q—I paint my home every two years. After a year or so the paint chips and peels in spots back to the bare wood. These spots seem to take paint again quite well but after a year or so it cracks and peels much the same as before. What can I do to prevent this?

R. F.—Lincoln, Neb.

A—We think the origin of your trouble goes back to the original primer. For some good reason the primer did not bond to the wood. There are, of course, various causes of paint failure, but judging from your description we believe the first primer was not sufficiently reduced to penetrate the wood. If a heavy primer is applied the oils will be absorbed by the wood, leaving the pigment on the surface. The only practical procedure we can recommend, other than removal of all the paint to the bare wood, is to prime the bare spots with a specially reduced primer to which is added benzol at the rate of $\frac{1}{2}$ pint per gallon of primer. Do not add benzol to the finishing coats; only to the primer. Allow the primer to dry for at least two weeks. Succeeding finish coats should be reduced with turpentine and oil to an easy brushing consistency and then brushed out to a thin, uniform film.

SPARTAN power SPRAYER ROUTS WEEDS AND FLIES —



PROTECTS TREES

New Spartan portable power sprayer provides best way to apply weed killers or insecticides. Delivers up to 3 gal. per min. of 10 to 200 lbs. pressure. Sturdy, reli-

able Spartan will win your battle against pests! Find out what Spartan will do for you.

SPARTAN PORTABLE POWER SPRAYER

KILLS WEEDS quicker, easier. **ROUTS FLIES** and mosquitoes from barns, homes, resorts! **DISINFECTS** poultry houses! **FIGHTS ROACHES** and other indoor pests effectively! **SPRAYS CATTLE** for more meat and milk production! Send for free catalog!

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MACHINERY CORP.
Lansing 4, Michigan

NOW you can PREVENT RUST and SCALE from forming in your AUTO RADIATOR

PROTECT your new car's cooling system from the start . . . and radiator rust-ups in your old car. Butler De-Scaler has been used with great success industrially for over ten years . . . proven in thousands of truck and bus fleets. Now available for car owners. Unconditionally guaranteed . . . for one year . . . will not interfere with Anti-freeze or stop leak. Easily installed . . . available at service stations, garages, and car dealers everywhere. If no dealer near you, write BUTLER ENGINEERING CO., 2622 Rousseau St., New Orleans 11, Louisiana.

New Fair Trade List Price \$2.95

Butler De-Scalers are also available for use in boilers, home hot water systems, Diesels, etc.



KEEP WATER CRYSTAL CLEAR. Installed in radiator hose, Butler De-Scaler's Galvanic Cell Action prevents **RUST** and **SCALE** throughout the entire cooling system. Causes the removal of **OLD RUST AND SCALE.**



BUTLER De-scaler

JUNE 1948

HAPPY HOURS and Miles of Fun with a HARLEY-DAVIDSON

This year take a vagabond vacation! See America's outdoor wonderland from a new and thrilling vantage point . . . the saddle of a smooth-riding, fleet-footed Harley-Davidson! Discover the delights of "gyp-sying" along strange highways, of roaming down wilderness byways . . . with a pal or a gal, and the whole world unfolding before you! Visit scenic splendors, faraway places — take in exciting race-meets, endurance runs, hillclimbs. Make your holidays happier, every spare moment memorable, in the world's greatest sport . . . motorcycling! See your dealer today. Mail coupon now.



HARLEY-DAVIDSON MOTOR CO.
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Send free copy of **ENTHUSIAST** magazine, filled with motorcycle action pictures and stories; also literature on latest models.

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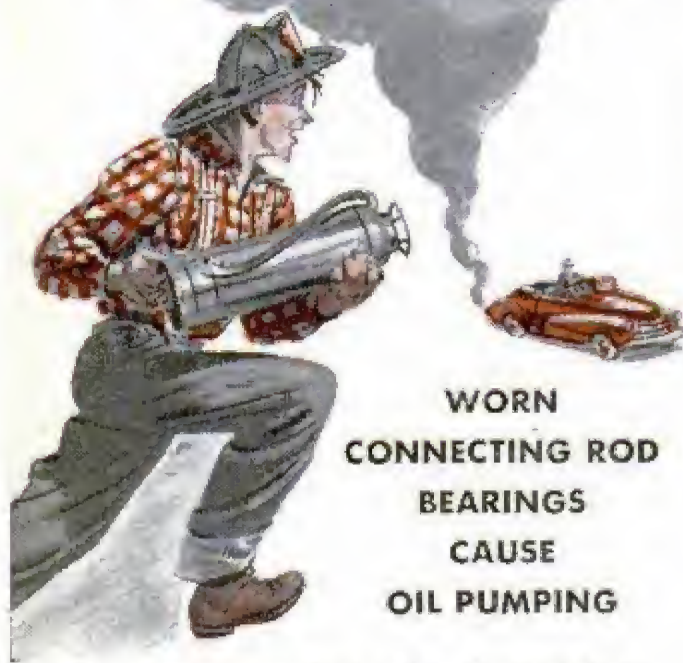
237

PERFORMANCE GOES UP IN SMOKE . . .

"Drop the extinguisher, Joe..."

he needs

FEDERAL-MOGUL ENGINE BEARINGS"



**WORN
CONNECTING ROD
BEARINGS
CAUSE
OIL PUMPING**

When the connecting rod and crankshaft bearings in your car are worn, they let excess oil reach combustion chambers. You burn up dollars when power and pep pour out the tailpipe as smoky exhaust.

To restore quick pick-up, power and performance, replace with Federal-Mogul Oil-Control Bearings. They're engineered for the job — ask your mechanic.

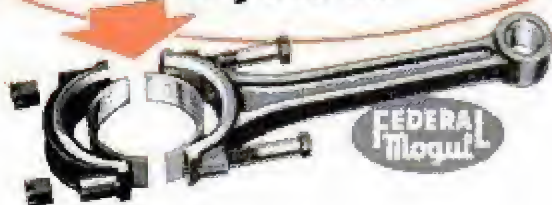
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(DIVISION OF FEDERAL-MOGUL CORPORATION)
COLDWATER, MICHIGAN

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**Oil-Control Bearings
in your car**



reversing is. A sternwheeler pushes the water straight backwards or forward with her paddle wheel. She has four rudders ahead and three aft of the wheel—it makes no difference which direction she is going, some rudders are always receiving the solid thrust of water from the paddle wheel. The conventional ship has only one propeller and rudder. When reversing, the propeller is throwing the water away from the rudder, which then has little effect in steering. And to complicate the problem further, the propeller also throws water to the starboard side when reversing. This pushes the ship to the port (left) side and is difficult to counteract. This "crabbing" is not present in ships with twin propellers and is not as noticeable in small tugs, but it does prevent most freighters from reversing to starboard to help a small tug. And even a twin-screw ship is hard to manage in reverse unless she has considerable space to maneuver in.

Captain Harris recalls one deep-water skipper who brought his ship up the Columbia for the first time in 1944. "He said we made him dizzy, the way the Henderson threw his ship around. Couldn't understand it until I took him aft and showed him our rudder power."

The new Portland has performed admirably since her first test run last August. She and the old Henderson are handling a majority of the ships that enter the Portland harbor. Several other old sternwheelers are also berthing ships as well as towing log rafts and sawdust barges up and down the river.

One job was taken from these sternwheelers by the late war. Huge "cigar" log rafts formerly were wrapped with massive chains like gargantuan packages and towed by the paddle wheels down to the Pacific Ocean from where they were towed by sea-going tugs to San Diego, Calif. Their vulnerability to enemy submarines stopped this towing during the war and closed the mills that used the logs. Today, plans are being made to tow similar rafts from Alaska to the States. Transporting such a huge quantity of lumber in one load is an extremely economical method of transportation. Amazingly, the greatest danger is not of the rafts breaking up out at sea. The danger is of fire.

When buffeted constantly by the heavy Pacific swells, friction among the logs of the cigar rafts sometimes becomes so intense that the logs will burn deep inside the raft, usually charring or destroying a good portion of the load.

The old sternwheelers have played a

(Continued to page 240)

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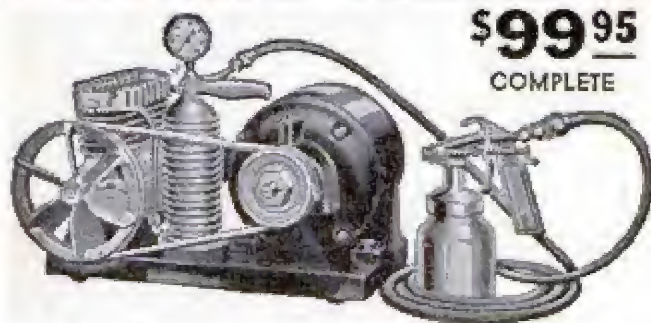
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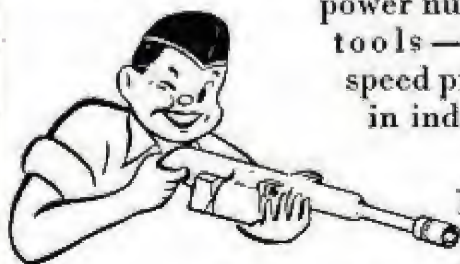
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major part in the development of the Pacific Northwest. Their history goes back to 30 years after the expedition of Lewis and Clark. It was in 1835 that a sway-backed compromise between a sidewheeler and a sternwheeler blundered around the Horn from England to Hudson Bay's Fort Vancouver on the Columbia. This was the Beaver, built on the Thames River for the fur traders. She sailed to the Pacific coast with her paddle wheels in the hold—no one trusting the new-fangled steam. But her steam-powered paddles were so successful that others were built and improvements made, resulting in the sleek packets of the turn of the century.

The rivermen now admit that the railroads are better for hauling freight. And they admit that one ocean freighter did navigate a portion of the dangerous waters above Portland. That ship, the Wheeler, made the trip up the Columbia in 1937 to The Dalles, Ore., 100 miles above the main sea channel at Portland. That stretch of the upper river was really not dangerous in 1937 as the Bonneville Dam has changed its rapids into a placid lake. Even so, two sternwheelers, the Cascades and the James W., were chartered to go along to keep the freighter out of trouble. No ocean ship, before or since, has attempted the now-easy trip, although huge locks were built in Bonneville Dam for the purpose.

The rivermen were not disgruntled when the Wheeler made the trip. The presence of the Cascades and the James W. justified their creations. And the spanking new Portland is paying an honest tribute from the marine engineers of today to the designs of yesterday.

Can We Save Our Trees?

(Continued from page 149)

only because they fall by accident beneath some protecting shrub, weed or tuft of grass. This low growth must be encouraged if the giant tree cactus is to reproduce in its desert home.

On the West Coast a mystery disease called "quick decline" is striking through the orange groves. Quick decline affects only orange trees, and of those only the trees having sour root stock. In the past two years, about 40,000 trees have been affected or killed by the disease. Scientists have learned that quick decline is caused by a virus, and have tried treating the trees with penicillin and sulfa drugs. The work is under way at present and results have not yet been announced. No insect carrier for the virus has been found, but the

(Continued to page 242)

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because they have found that they

insure better, more dependable engine
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DEMAND NEW DEPENDABLE CHAMPIONS FOR YOUR CAR

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research workers are reasonably sure that such a carrier exists.

One disease which blankets much of the country is white-pine blister rust. It covers the lake states, the eastern seaboard as far south as Virginia, and the great forests of the Northwest. Blister rust is an example of how a foreign disease can be introduced into this continent. The disease first was reported in 1906. Investigators learned that infected seedlings had been imported from a single nursery in Germany and distributed to 200 different localities across North America. Thus the disease had an opportunity to strike on 200 different fronts at one time.

Today after years of research the Division of Forest Pathology has the answers to control of blister rust. The fungus requires currant or gooseberry bushes as an alternate host—it will not survive unless it can go from white pine to bush and back to the tree again. Farmers, foresters and nurserymen all over the country are removing such bushes from the vicinity of white-pine trees. Rust-resistant pines are being developed for future plantings.

Within the past few years a mystery disease has been killing thousands of oak trees in the Middle West. Once it strikes a tree it can turn the leaves brown within a week. Research workers have found and

identified the fungus that causes it and are delving into this new threat in an effort to discover how it is spread.

What is most feared by these guardians of our trees is the introduction of some foreign insect or fungus which could gain a foothold and then rage through the thousands of square miles of Douglas fir stands. Our recent years of lumber shortage would seem like years of plenty if this occurred. And any disease that crops up unannounced in a forest-tree nursery might be shipped unwittingly to hundreds of different localities.

Agencies other than the USDA are aiding the fight to save our trees. Commercial tree surgeons are helping solve local problems. Universities and state departments of agriculture have done valuable work on trees within particular regions. Dr. Pierre Miller of UCLA has developed a "hot water" treatment that kills tiny roundworms causing wartlike growths on peach trees. The Los Angeles City Tree Surgeon administers shots of iron-citrate crystals into the city's eucalyptus trees to cure them of an ailment brought on by an iron deficiency in the soil. Although this deficiency is not a disease, it can so weaken trees that they will die or become subject to disease.

Insect pests that cause damage or carry

(Continued to page 244)



MARTIN
"40"
4½ H.P.
35½ pounds
MARTIN "60"
7.2 H.P.
43 pounds
MARTIN "20"
2½ H.P.
29½ pounds

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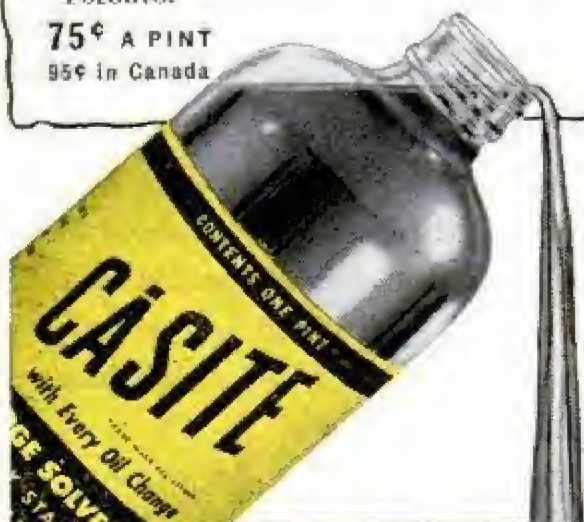
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diseases somehow develop a relative immunity to poisons by evolving new strains. This is one of the reasons why the codling moth is still a pest in American apple orchards. Thus the enemy of the USDA scientists may undergo a change in the middle of the battle. Fighting such an enemy is a job requiring patience measured in centuries rather than years. Yet it's essential if we are to save our forest and shade trees from these fifth-column diseases, which cause a greater loss in lumber each year than the total loss from forest fires.

Attacking the Mysteries of the Atom

(Continued from page 102)

Commission and Office of Naval Research.

One interesting use concerns the feeding of radioactive carbon dioxide to plants in studies aimed at solving the mystery of photosynthesis. The problem is to learn the process by which a plant transforms carbon dioxide into carbohydrate. A possible offshoot of the work will be to learn how to control plant enzymes and this offers the attractive speculation that someday it may be possible to reduce drastically the growing season of valuable food plants without affecting their other qualities.

Radio-iron is being employed in tests for determining the best conditions under which blood transfusions should be made as well as the best conditions under which human blood should be stored. Radio-iodine is being used to study goiter and other thyroid diseases, and other radioactive isotopes are proving valuable as diagnostic aids against some kinds of malignant tumors as well as disorders of the circulatory system.

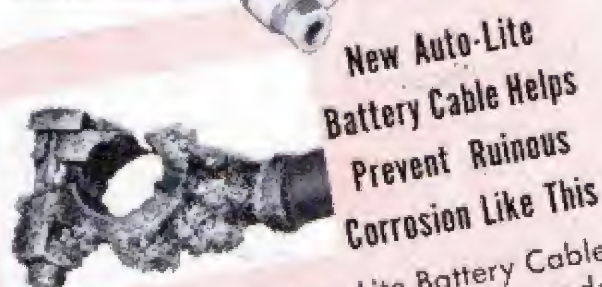
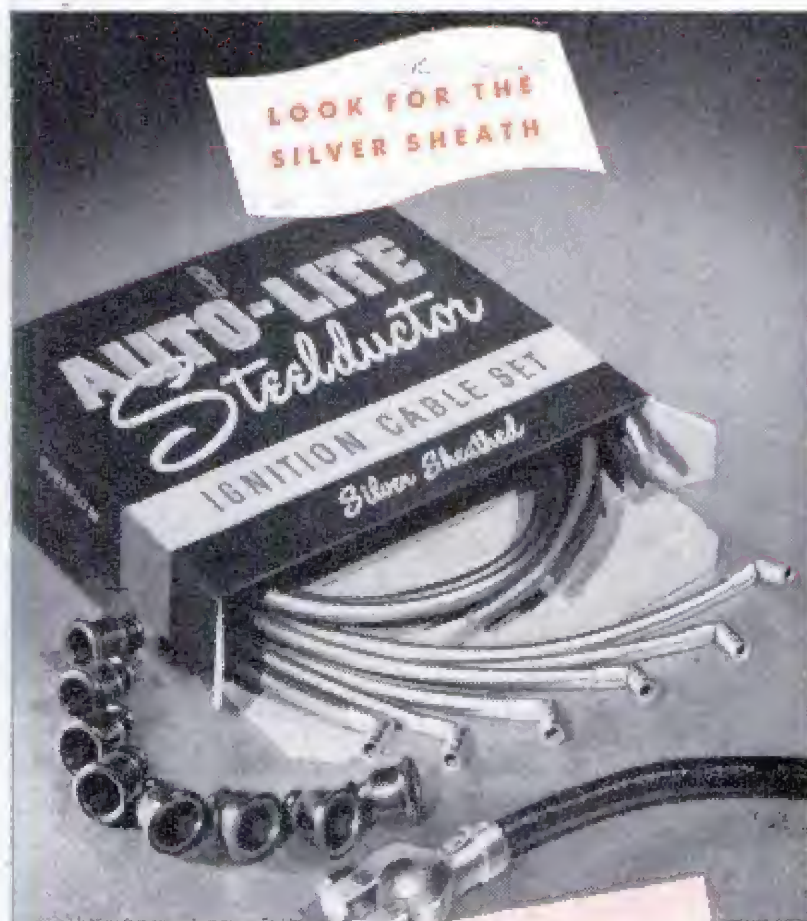
The tracers allow scientists to study the paths of different minerals and chemicals in the body and to learn what uses are made of them. Poisonous substances as well as nourishing materials can be studied in the same way. Everyone knows, for example, that an overdose of carbon monoxide is lethal and now the scientists are trying to discover what organs are affected by carbon monoxide and just what the reactions are.

Their technique is to place a small amount of radioactive Carbon 11 in the atmosphere that a volunteer is breathing and then to trace the distribution of the tagged atoms through the body by means of gamma-ray counters placed close to the body. Carbon 11 has a half life of only 20 minutes and so a research worker stands ready at the University of California cyclotron while the tracer material is being

(Continued to page 246)

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Properly installed, Auto-Lite Battery Cable with the revolutionary Anti-Corrode Terminal, helps prevent resistance-building corrosion that restricts proper current flow to the starter and other electrical units.
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manufactured and then runs with it to an adjoining building where the carbon monoxide setup is ready and waiting for the experiment.

Contributing to the accuracy of physiological studies has been the development of small vacuum-tube counters that can be placed directly against the skin or even placed inside the mouth for close observations. The tubes for detecting some kinds of radiation need no shielding. Tubes for detecting gamma rays are placed inside a heavy lead shield with one opening at the bottom so as to insulate them against stray "background" radiations.

Radioactive arsenic is being used in the treatment of leukemia and Hodgkin's disease with some success. Arsenic has been used for treating leukemia for many years, but the radioactive use is new. It is being tried in the hope of obtaining both the chemical effect of arsenic and the radiation effect of the radioactive chemical.

The mysteries of the atom are still far from solved. To many people the atom means only the threat of mass destruction by atomic bombs. But to the scientists, working on the constructive use of atomic power, the mysteries of the atom, once solved, will open the door to a better life.

Jet Roost on a Flattop

(Continued from page 110)

from the hangar deck as well as from the flight deck.

The jet pilots greatly prefer catapulting to flying off the deck. A catapulted plane leaves the ship with an air speed of 120 or 130 m.p.h. and in case of engine failure has a wide, easy gliding range. But if an engine fails during a deck fly-off the jet falls into the sea, right in front of the carrier.

Pilots maintain that carrier landings are easier with jets than with piston-engine aircraft, mainly because of their increased visibility. For the first time, they say, they can see the deck ahead of them and below them as they come in, instead of peering along the side of a big engine that gives them a view only of the landing officer and the port side of the ship. And because of this better view the pilot can align himself more accurately with the ship and there are fewer wave-offs.

Other reasons carrier pilots like jets for landings are that they don't have to fight engine torque that tends to slide the plane toward the right and also there's no chance of oil fouling up their windshields and obscuring the view.

Because of its changed center of gravity

(Continued to page 248)

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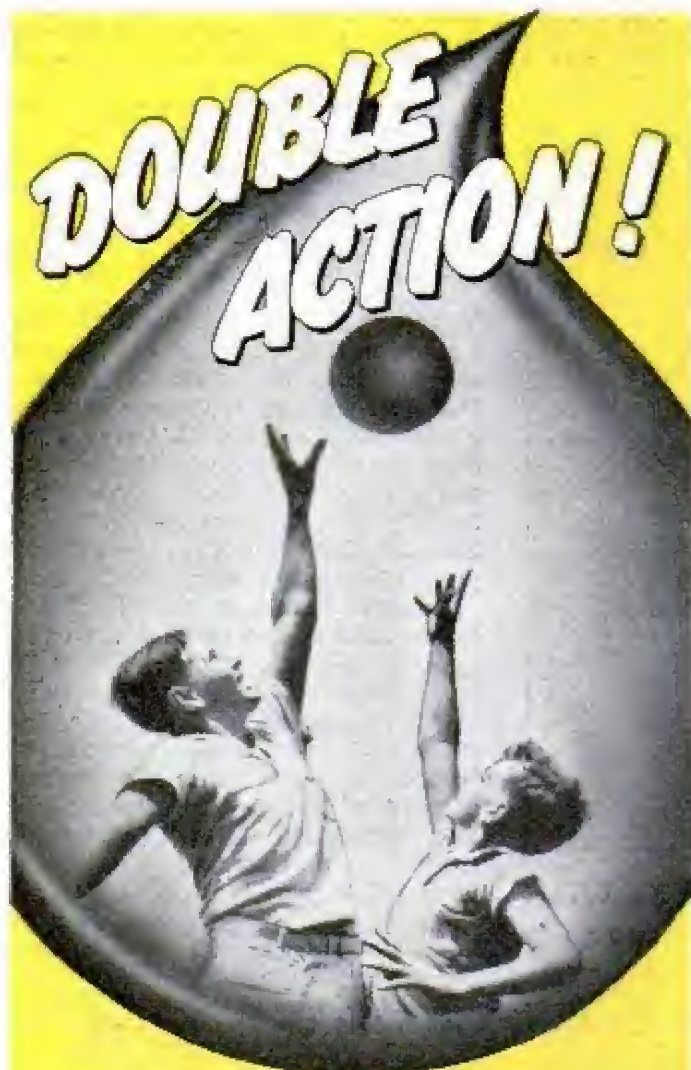
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The sooner you order, the sooner you'll have this handy new tool in your hands. It's a real bargain—only \$9.95, complete with five-inch rubber disc, sheepskin bonnet, and 3 sanding discs. (Extra bonnets, \$1.25—extra medium and coarse sanding discs, 10c each.) If your dealer doesn't stock, send cash, check or money order for \$9.95, postage prepaid. C.O.D. plus postage.

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a jet aircraft handles differently when low on fuel than it does when fully loaded, altering the maneuvering and landing characteristics. To minimize shifting, the Fury retains all its spent shell cases on board and has a fully automatic fuel transfer system that moves the supply around from tank to tank as it is consumed, to retain the original center of gravity.

Carrier deck crews have to observe special precautions while working around jets. They can crawl under planes but may not pass close around the front or rear of them. They can't wear protruding pencils or handkerchiefs that may be sucked out of their pockets into a jet's intake. For the same reason they must wear their hats turned down.

Take the Wheel of a New Hudson

(Continued from page 91)

maintains an amazingly even keel. You try the same stop again. The result is identical. No pitch at all.

"How come?" you ask Bald.

"A good many things combine to make a car ride like this," he says. "There's the single unit frame and body structure, direct-action shock absorbers, the low center of gravity and almost perfect balance. The engine has been moved forward a little and the back seat is no longer over the rear axle but moved forward even ahead of the rear wheels. There are coil springs in front and leaf springs in splayed position—slightly at an angle—in the rear. Get in back once and let me drive for a mile or so over this rough stuff."

You soon discover that the wide back seat of this car offers you a "front seat" ride in smoothness.

"While you're back there I'll turn the radio on," says Bald. "Notice how low the volume is and the fact that you can hear easily in the back. The reason is that the speaker is here on top of the instrument panel and throws the sound upward."

Back at the wheel you start off like a veteran Hudson driver. The car hugs the road. At 60 m.p.h. you meet a huge trailer truck and feel no push of air against your car. Mile after mile the road to Port Huron, Mich., spins by. Suddenly you are shocked to look at the speedometer and see it registering 90 m.p.h. You quickly lift your toe from the accelerator.

"Felt like only 70," you apologize to Bald.

He smiles. "A good many people make that mistake and it may be because we are sitting closer to the ground."

An absent-minded driver creeps onto the

(Continued to page 250)

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110-volt AC operation

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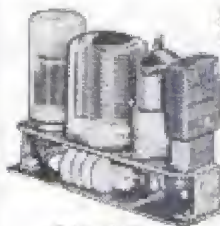
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Heathkit Beginners' Radio, battery type (2 tubes, no rectifiers) **\$8.75**
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2 1/2" permanent magnet loudspeaker for either type **\$1.95**
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highway from a side road. You quickly apply the hydraulic brakes.

"Where do you think you'd be if the hydraulic brakes failed?" Bald asks.

"Probably at a harp counter," you guess.

"Not in this car," Bald says, "you'd be right here slowed up just the way you are. When the brake pedal goes all the way down it engages reserve mechanical brakes. We've been using these for years."

You try a few curves at reasonably high speed. There is no top-heavy feeling about this steady low-slung car.

"The fact that the car is low is not the only reason it takes curves like this," Bald explains. "The front and rear stabilizer bars help resist sideways."

Now for some pickup tests. Successive trials with Drive-Master shift show that the car accelerates from 10 to 40 m.p.h. in 15 seconds; 10 to 50 m.p.h. in 19 seconds; 10 to 60 m.p.h. in 29 seconds. From a dead stop the car accelerates to 40 m.p.h. with Drive-Master in 12 seconds, and in conventional shift (through three speeds) from 0 to 40 m.p.h. in about the same time.

Returning from Port Huron the skies open up and rain comes down in sheets. This pleases Bald who opens the cowl ventilator which lets fresh air in and drains out the rain.

"Sorry it isn't cold enough to turn on the heater," says Bald, "so I could show you our special Weather-Control which not only warms the air but filters and circulates it and keeps it constantly fresh."

Miles farther on you turn into a side road in the quest of hills or deep ruts. The car takes the steepest hill you can find with the ease of a veteran mountain climber. A couple of times in deep ruts and chuck holes the car scrapes the road.

"Not a good car for a farmer or rancher who lives on a back road," you suggest.

"As good as any modern car," says Bald. "Despite the extra-low appearance of the car, our ground clearance is average."

By the time you are back in the heavy 5-p.m. traffic of Jefferson Avenue in Detroit you are handling the new Hudson, Drive-Master and all, as if you had driven it for months—and you wish you had.

HUDSON SPECIFICATIONS

Engine.....	L-head, 6 or 8 cyl.
Compression ratio.....	6.50 to 1
Wheelbase.....	124 in.
Over-all length.....	207½ in.
Height.....	60 in.
Body width.....	77-1/6 in.
Front seat.....	64 in.
Rear seat.....	63 in.
Weight (4-door Commodore Six).....	3540 lbs.
Front springs.....	coil
Rear springs.....	leaf
Ground clearance.....	8 in.
Speed.....	100+ m.p.h.
Tires.....	Super cushion 7.10 x 15



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Motorists Wise

SIMONIZ

TRADE MARK REG.

GIVES CARS LASTING BEAUTY

Palomar Opens Its Eye

(Continued from page 85)

and insulated with aluminum foil. Hot air between the double wall escapes through openings in the top of the dome. Ventilating fans are used after dark to fill this space with cool night air.

The dome shutters are opened just after sundown so that during the next hour any slight difference between outside and inside temperature can be brought into balance. Floodlights inside the dome are housed in insulated cells that prevent radiation of heat from the lamps, even though the floodlights are never used when the telescope is at work.

The Mt. Wilson and Palomar Mountain telescopes will cooperate in astronomical and astrophysical research and, in fact, are to be placed under a single administrative management financed by the Carnegie Institute of Washington and the California Institute of Technology. Ordinarily each will be concerned with its own program of research but on occasions when different types of observations of the same body must be made simultaneously the two telescopes will be turned toward the same portion of the sky. Eventually, the observatory council expects, a modulated light-beam telephone will connect the two domes so that astronomers at work at each telescope can discuss their expeditions in space.

Torpedo Speedway

(Continued from page 106)

division of the Inyokern Naval Ordnance Test Station in the California desert, which also has a huge Pasadena laboratory known as the Underwater Ordnance Division. In effect the torpedo range is the proving ground for ideas developed in the Pasadena laboratory.

The lab fires torpedoes in miniature, using scale models of suggested shapes and designs. They are fired into water tanks so that their underwater travel can be recorded by high-speed cameras that make exposures as short as a 500,000th of a second and can take 500 individual pictures in a second's time.

One problem has been to eliminate the cushion of air that is carried underwater when a torpedo hits the surface. Unimportant though this air might seem to be, it could slightly affect the missile's course. One suggestion has been to provide numerous small holes or indentations in the outer skin of the torpedo, into which the

(Continued to page 254)

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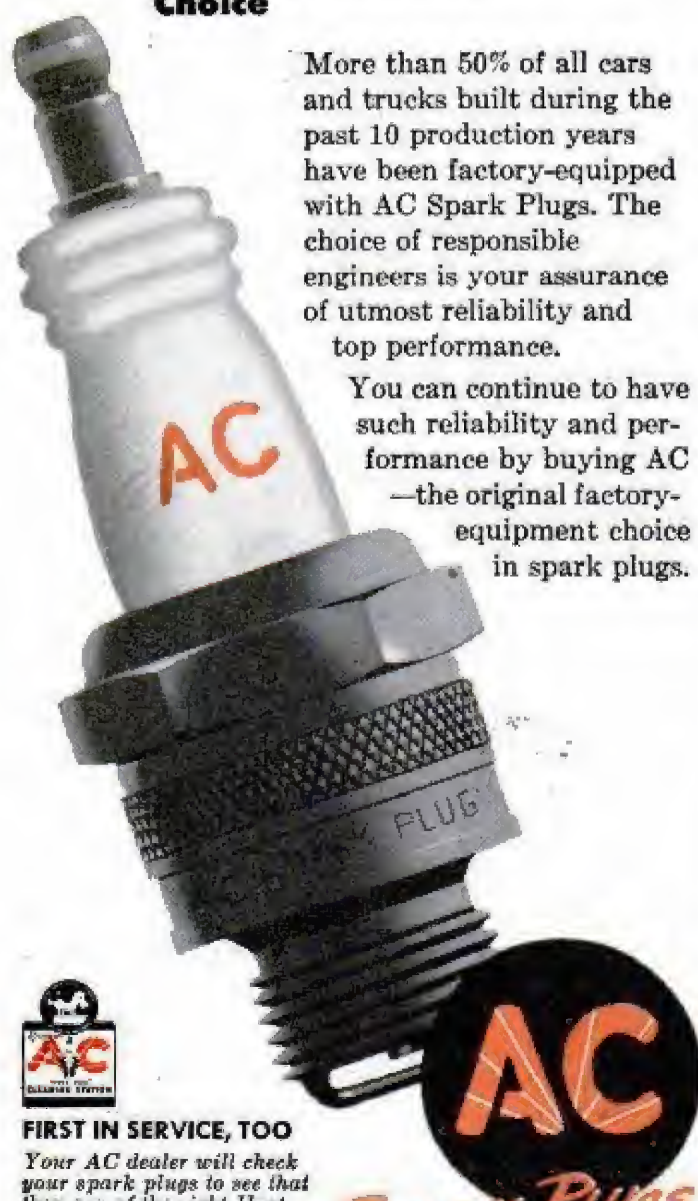
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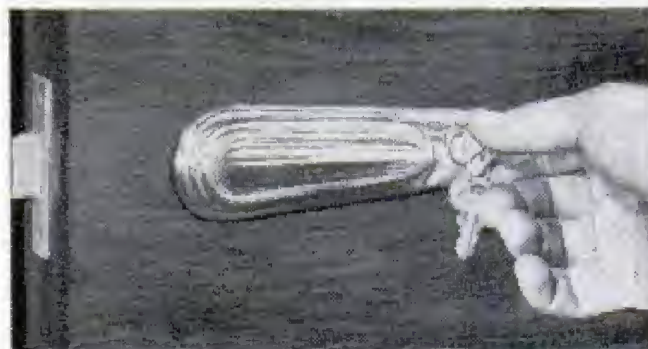
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air could be compressed. Another has been to band the torpedo with a series of small ridges behind which the air could escape upward to the atmosphere.

Actually very little information on the effects of air, water turbulence and other phenomena on the movement of underwater missiles was available until the Navy laboratory was established. The shapes of torpedoes were designed by the trial-and-error method, then this was improved upon slightly by the testing of models in towing basins and channels. Not until high-speed cameras and high-speed light flashes were sufficiently developed was it possible to actually observe scientifically the behavior of submarine bodies in motion. With these new tools the Navy has obtained basic data that is having an effect on the missiles it is now designing. What these missiles are, what they will do, what they look like, all is secret information.

Handle Locks Flush With Surface



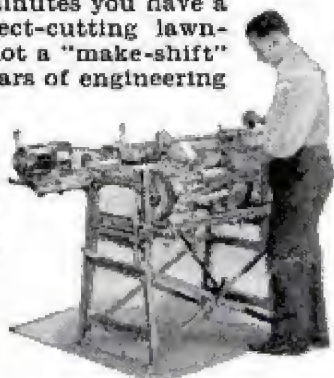
With flush-type locks there's no doubt about whether or not the door is locked—if the handle is pushed in, the door is locked. When the key is turned, the handle springs out. No key is required for locking the door. Presenting a flush surface, the lock eliminates the hazards of torn clothing and personal injuries. Primarily used on trailer coaches, the locks can be installed on station wagons and automobiles. A new model, designed for lockers in schools and gymnasiums, eliminates the necessity for padlocks and protruding handles. The chrome locks require only four small holes for installation.



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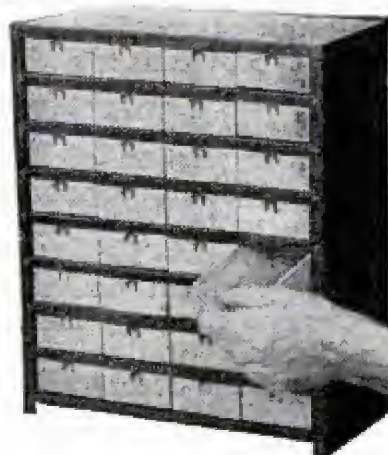


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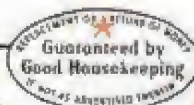


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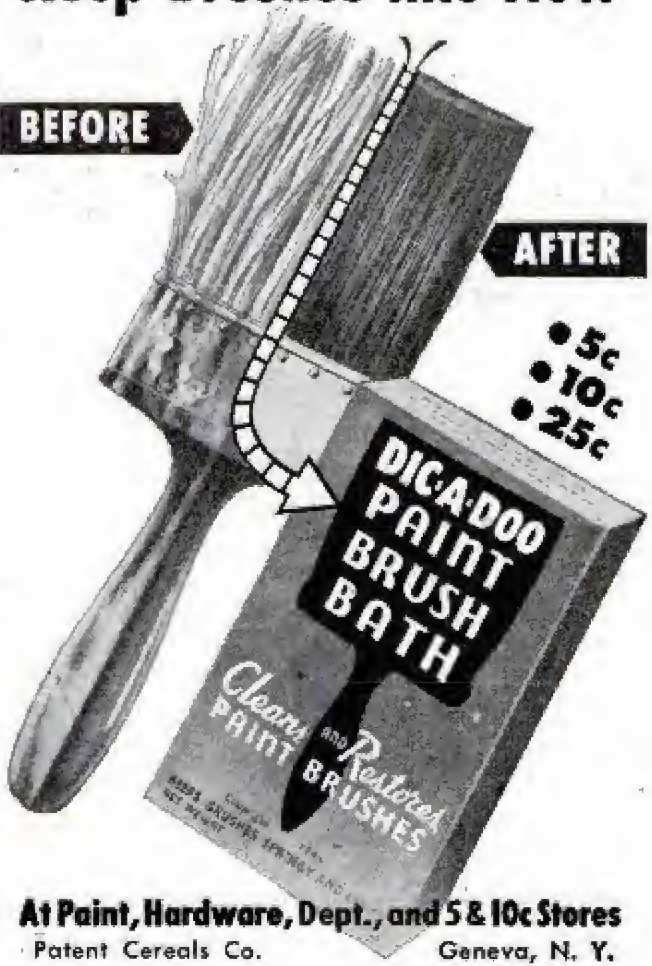
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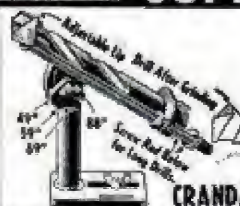
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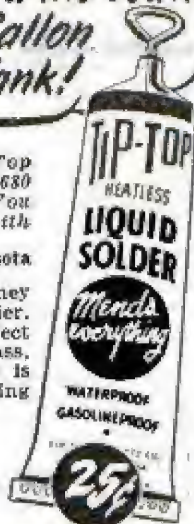
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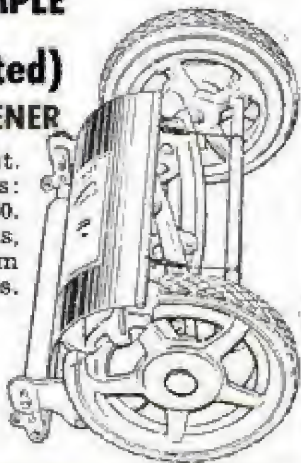
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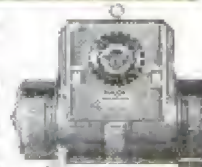
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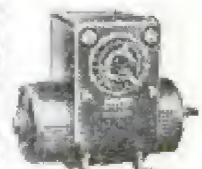
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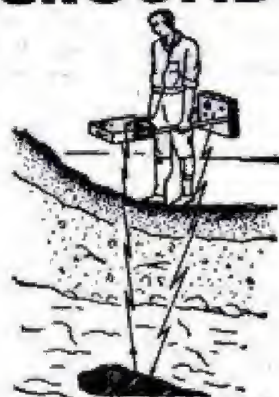
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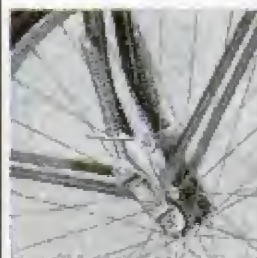
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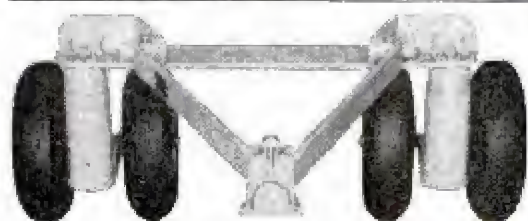
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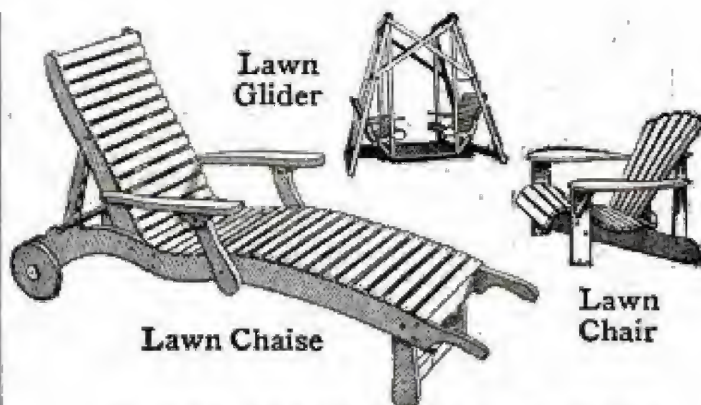
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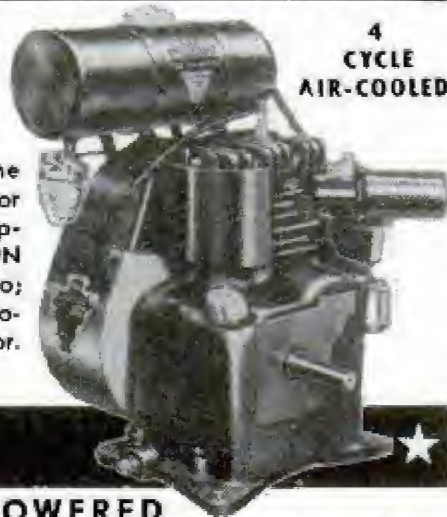
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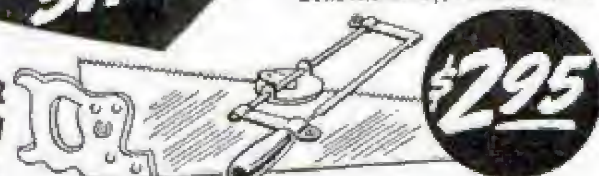
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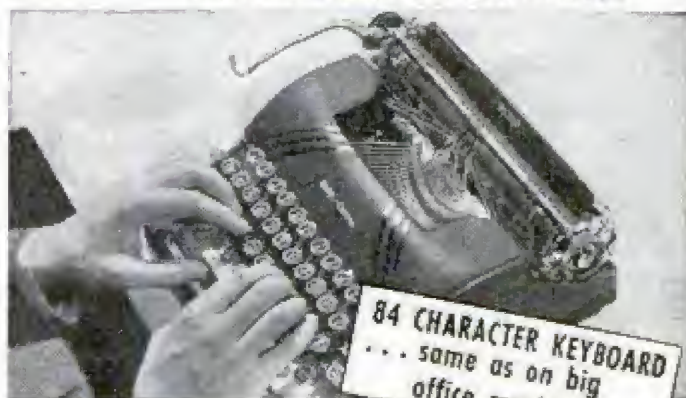
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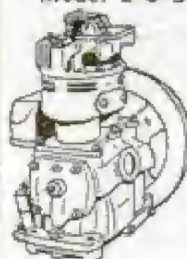
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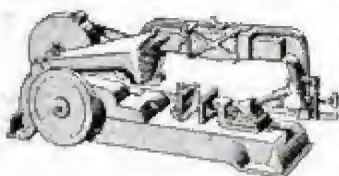


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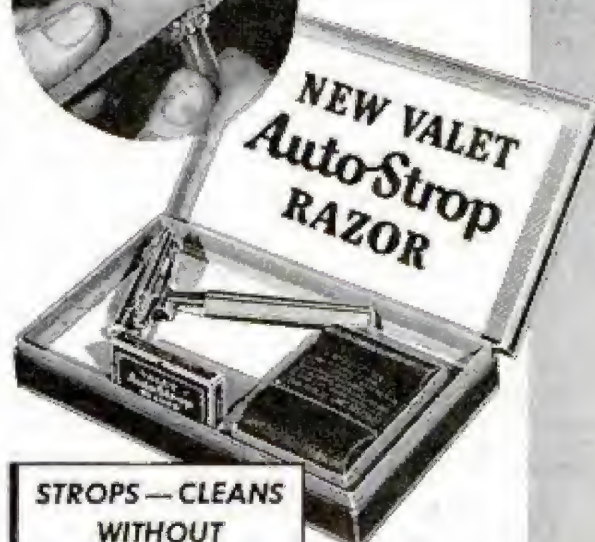
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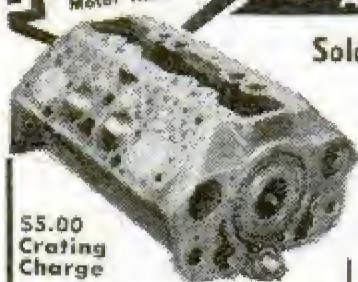
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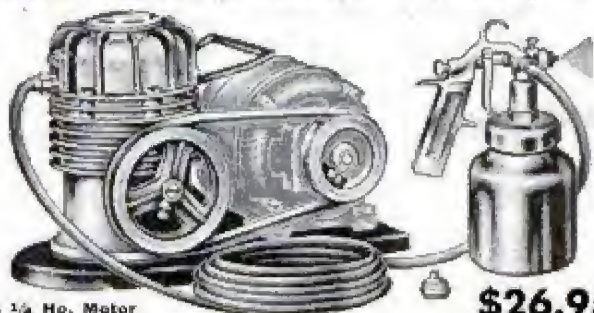
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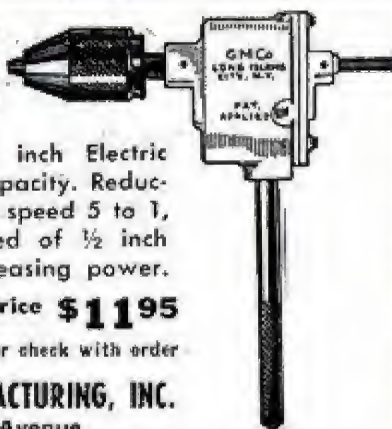
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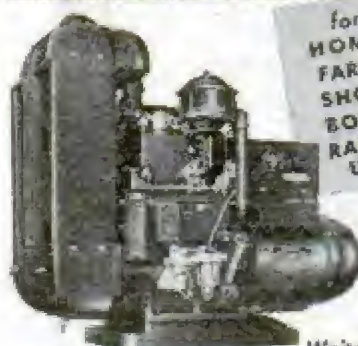
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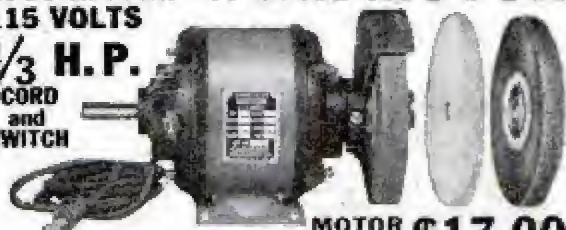
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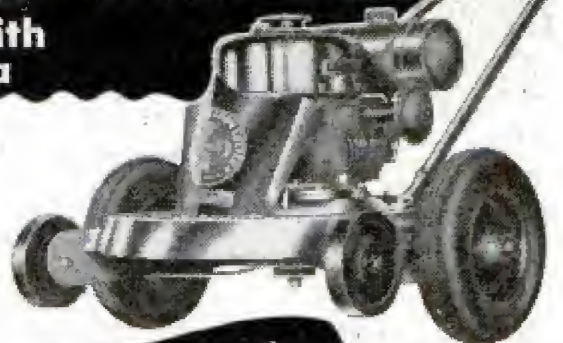


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Everyone that sees this outstanding Cell-U-Mop immediately wants one . . . That's the reason why our distributors are so successful . . . You also have the advantage of our other QUICK SELLING PRODUCTS that step up your Volume Sales and Profits.

• We Teach You How •

Gets down under and around for MOPPING, DUSTING or WASHING

DOES THE WORK OF 6 TOOLS IN 1

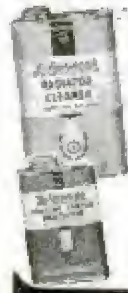
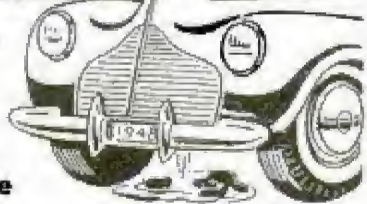
Get Choice Territory NOW!

Holds 20 times its weight in water.



Don't Risk Engine Overheating

Keep cooling systems ALWAYS up to par with regular **Warner** care



Warner Liquid Solder (Non-Metallic)
• Deposits tiny fibers to repair leaks anywhere in the cooling system.

Warner Radiator Cleaner

• Thoroughly cleans cooling system of rust, oil muck and grease.

Warner Cooling System Protector

• Prevents rust, scale and corrosion.

No delays—just pour in and keep on driving. Do it yourself, or ask your service man.



Warner-Patterson Co., 920 S. Michigan Ave., Chicago 5

ELECTRIC SHEAR SHARPENER

Over 35,000 Sold — It Must Be Good!



Genuine Carbide wheel ideal for shop or home use. Send remittance with order and shipment will be made at once, prepaid to your door, complete with electrical goods catalogue.

\$9.75 complete with vise

WILLIAM MARVY COMPANY
479 West St. Peter Street St. Paul 2, Minn.

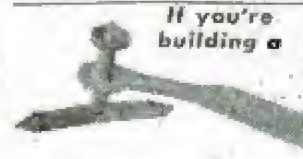


INDICATOR CALIPERS

A spring actuated indicator hand enclosed in one of the hollow legs has a pointer which comes to the outside through a slot and moves across the indicator marks giving about 30 to 1 multiplication of the movement at the contacting end of the hand.

Bright stainless steel throughout. 4 inch size, either inside or outside \$2.75 each postpaid.

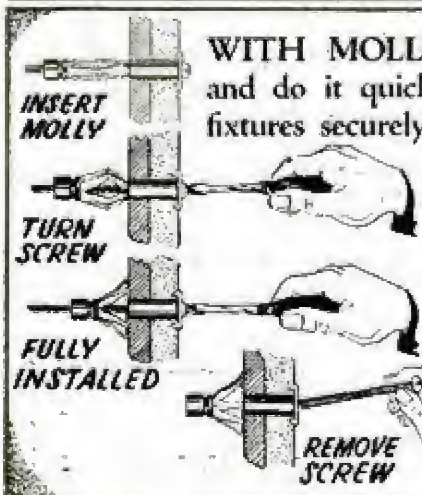
WOODWORTH SPECIALTIES CORP.
BINGHAMTON, N. Y.



WHIRLBLADE POWER LAWNMOWER

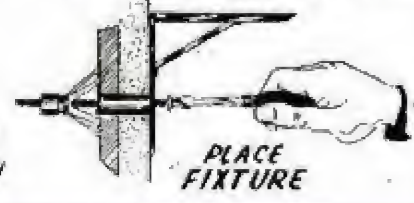
Why don't you try the bearing and roller attachment that has the roller lugs as part of the casting. You built a power mower easier, faster, stronger, with less weight and with less expense. Standard widths of cut 16", 18" and 20". Let us know width of cut desired and engine you will use. Order now—\$16.50 postpaid. 16" wheels to match \$3.00 each. Front wheel \$3.00. Streamlined fenders \$1.50 pair. Also, complete mowers and new gasoline engines ready for delivery. Special list for dealers, shops and others.

WEBB MFG. CO.
703 E. Poplar Avenue
Arkansas City, Kansas



WITH MOLLY YOU CAN FASTEN ANYTHING and do it quickly, neatly and safely. MOLLY will hold fixtures securely to floors, ceilings or any hollow wall construction . . . Simple to install, all you need is a screw driver. Sold by leading hardware stores everywhere.

Write for Free Descriptive Folder



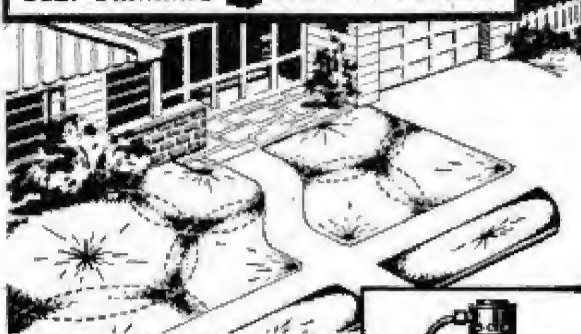
MOLLY
SCREW ANCHORS

MOLLY CORP.
522 COURT STREET
READING, PA.

You Can Afford an Underground
Lawn Sprinkling System with

AQUASpray

SELF-DRAINING SPRINKLER HEADS



EASILY INSTALLED BY ANYONE

All bronze. Exclusive self-draining feature protects against freezing. Adjustable to any shape lawn. Six heads required to spray 500 square feet.

Write for Descriptive Literature 1401 - 190408

AQUA-SPRAY LAWN SPRINKLER CO.

439 E. FORT ST. DETROIT 26, MICHIGAN



**AQUA-SPRAY
AUTOMATIC RELAY VALVE**
Easily attached to present water outlet. Boosts spraying capacity 6 to 8 times. Automatically sprays sectionalized areas. All bronze—needs no motor. **\$75.00** PREPAID

MARCOT KEY MACHINES

MARCOT No. 8 KEY MACHINE, mounted on Cabinet \$ 82.50
Auto Code Book and Auto Depth Keys 12.50
1,944 Popular Cylinder Key Blanks 77.75
Set — Key File, Follow-Through Rods, Lock Picks, Bit Key Gauge, Thimble, Pins, Springs... 10.50
"Locksmith Trade Book"..... 6.75
How to Open Locks without Keys or Picks; Secret of Locksmithing; How to Make Keys by the Impression Method; Master Key Systems. **TOTAL COST.....\$190.00**
The \$77.75 cost of the Key Blanks would return to you \$486.00 or more. This would more than pay for your entire KEY MACHINE OUTFIT. **IMMEDIATE DELIVERY**—Motors available with Key Machine Orders. **1200 N. KEDZIE AVE. A. J. MARCOTTE CO. DEPT. PM, CHICAGO 31, ILL.**

BUILD-ARC WELDER

For Light or Heavy Work. 75-200 amps. No previous experience needed. Complete PLANS and valuable Catalog 35c. **LEJAY MANUFACTURING CO. 1347 LeJay Bldg., Minneapolis 8, Minn.**

FROM OLD GENERATOR

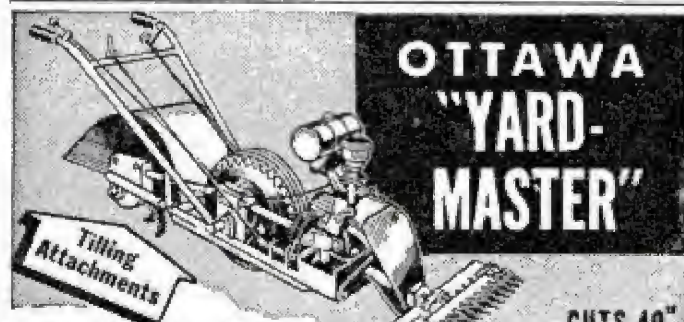


PESCO AIRCRAFT ELECTRIC MOTOR PUMPS

Complete with 1/4 HP Electric Motor Self Contained Explosion-Proof
Ideal for pumping Gasoline, Oil, Water, Liquids, Farms, Cottages, Basements, Laboratories, Boats. 24 Volt Ac. or Dc. can be converted to other Voltage.
\$15.00 FOB Detroit, Mich.
BENJAMIN SALES COMPANY 8774 L'ANWOOD DEPT. M DETROIT 8, MICHIGAN



Say You Saw It in Popular Mechanics



OTTAWA "YARD-MASTER"

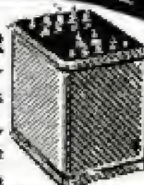
CUTS 40" SWATH

Most useful machine of its kind. Powerful 2-HP motor. It mows grass or weeds, tills soil and cultivates (see picture), moves snow, pumps water, runs a grinder, etc. **TWO SPEEDS** and Free Wheeling. Nothing else like it. "YARD-MASTER" is much needed year 'round machine. Mows close to trees and under fences. Follows ground contour. One man mows 3 to 6 acres a day. Boy or woman operates easily. Designed for private homes, estate, etc. Sold direct to user. Free details with low prices. **OTTAWA MFG. CO., 3-827 Lawn Ave., Ottawa, Kansas**

WAR SURPLUS AND OTHER BARGAINS

TRANSFORMER

Jefferson Electric step up or step down transformer. Input, primary 110-117 Volts A.C. Output, from 5 Volts to 650 Volts. Suitable for use with war surplus gadgets, heater relays, radio test filaments, electric trains, house chimes, etc. Weight 10 Lbs. **New \$7.95 Each**



BLOWER COOLER or HEATER:

For trailers, autos, offices, darkrooms, homes. DUMORE Motor, 1/6 cont. HP, Amperage 7.5, RPM 6400, 24 Volts. May also be used as dryer. Simple installation, radiator type, copper coils. Transformer advertised in this ad will operate this unit from house current. Weight 13 Lbs. **New, \$15.00**

SEND CHECK, MONEY ORDER or CASH



SCOOP!

We have been awarded 100,000 genuine briar pipes by Quartermaster Corps. Assorted shapes and sizes. All popular makes. Set of 6, **\$3.50**



MICROMETER

Chrome plated, precision engineered and carefully tooled to give long life... all new. 0-1" capacity, **\$2.25**. 1-2" capacity, **\$3.50 Each**.

EMERSON 3 HP MOTOR:



AAF Type D50. This motor can also be used as generator when driven by another motor. Ideal for portable welder, etc. 28 Volts, D.C. Compound, 3800 RPM, 115 AMP, windings glass-insulated, blower cooled, shaft dimension 5/8". Weight 27 Lbs. **New, \$13.95 each**



CONDUIT WRENCH:

Mfd. by JOAR. Jaws pass over conduit, pipe or tubing, slips down to snugly encircle fittings. Slight pressure tightens or loosens fittings. Will not mar or kink material. Set of 8. All new wrenches, Nos. 4-6-7-8-10-14-22-28, (Reg. cost \$50.00), **\$10.00 per set**.

25% DEPOSIT REQUIRED ON C.O.D. ORDERS



GOGGLES:

Designed for paratroopers. Great for motorcycling, speed boating, hot-rod driving, etc. (One polarized and one clear) All new.....2 pair for **\$1.00**.

MARINE TYPE LAMP — For

patios, boy's rooms, rumpus rooms, dens, doorways, gates. Solid brass, 11" high, 6 1/2" diameter. Clear, red or blue glass. May be suspended from ceiling or wall bracket (not included). Wired. Takes any size standard bulb. New. Weight 2 Lbs. Ea. **\$5.95**



4 in 1 SCREWDRIVER—3 smaller

sizes fit into 6" overall size. Fine steel bits. Solid brass handles. All new Each **\$1.00**

ALL PRICES F.O.B. CULVER CITY, CALIF.

SHIP'S BELL: U. S. Navy Sur-

plus. Solid Brass with smooth polished finish. 5" Diameter. Great for Patios, Doorways, in Dens, Ranches, etc. Matching solid brass wall bracket included. Weight 3 1/2 Lbs. All New. **\$5.95 Each**.



FISHING AND HUNTING



KNIFE
Hollow ground 6" blade of bright finish, high quality, tempered steel. Non-slip cowhide handle, with hand finished metal guard and butt. Stitched and riveted genuine leather sheath. It's a knife you'll be proud of! All New... **\$1.50 Each**.

CLIPS: Adel Aluminum Co., Rubber lined, hundreds of uses in any shop. Assorted sizes, all new, . . . 5 Doz. **\$1. — 500 \$5.**

PHOTO PAPERS: 1946-47 Dating. Guaranteed.

4x5 E. K. Aero Contact — S. W. Contr. 1 & 2 Minimum 3 gross — gross 47c
10 gross lots gross 35c
9 1/2"x200' Defender Velour Black enlarging semi-matte Contr. 2-3-4 roll **2.50**
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AIRBORNE SALES CO., INC. DEPT. PM 6-8 CULVER CITY, CALIF.

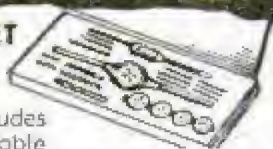
Save a "fortune" ON THESE BRAND NEW...GUARANTEED WAR SURPLUS ITEMS!



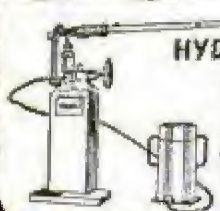
Rock Island VISE \$ **38.**
\$104. VALUE...

Has 6" jaw-10" opening,
swivel base. Replaceable
jaw faces of crucible steel

Greenfield TAP & DIE SET
VALUE OVER \$ **18.**
\$30.



Not! fine thread set includes
15 taps, 5 rounds adjustable
dies, all drills necessary for tapping 1/4" to 1/2"



WATSON-STILLEMAN 60TON
HYDRAULIC PRESS UNIT \$ **89.**
\$280. VALUE...

Build your own press at low
cost with this 2 piece, 60 ton
cap. unit. Free plans and par-
ticulars with jack and pump-
ing unit included

Hauck .. Kerosene
BLOW TORCH \$ **15.**
VALUE OVER \$30.

Economical! Generates in-
tense heat. No preheating
required. Use with air com-
pressor. Ideal for all heating
in shop and garage



Double Action HAND OIL PUMP \$ **1.**

Garage utility tool for 6.00 VALUE...
autos. Useful for removing oil from marine
engine crankcases. Angle spout included. Brass,
stainless steel or galvanized steel

Highly Polished 12" CALIPERS \$ **1.**
\$5.00 VALUE



For inside measurements. Lock joint design.



Farm-Home-Shop
GENERATING SET \$ **240.**
VALUE OVER \$500.

2500 watt-110 volt-60 cycle AC-6 1/2
HP Briggs and Stratton air cooled gas
engine — approx 300 lbs. crated-al-
used. Dep. of \$80 with order. Bal. on delivery.

MAIL YOUR ORDER ... NOW!

Enclose personal check, money order or bank
draft. All prices F.O.B. Hackensack, N. J.
Reference - CITY NATIONAL BANK &
TRUST CO., HACKENSACK, N. J.

BERKELEY DISTRIBUTORS INC.

16 Johnson Ave., HACKENSACK, N. J. - Dept. PM6

WALKIE- TALKIES!

Radio Telephone Sends And Receives Several Miles



This is the light weight battery-
operated radio that was used so
successfully by the Army. One
knob tunes both transmitter and
receiver. Sends and receives
merely by pushing a button.
Recommended for amateurs, ex-
plorers, police and Government
services, etc. Shipped ready to
operate, complete with tubes,
telephone handset, telescoping
antenna, and new batteries. Re-
built by the Government and
guaranteed. Price only \$45.00
each or \$90.00 per pair F. O. B.
Chicago.

Extra Batteries (80 hours con-
tinuous service) \$4.75 each.

Parts and Accessories for Walkie Talkies

We maintain complete stocks of replacement
parts, batteries, antennas, chassis, etc., for
Army Walkie Talkies and Handie Talkies.
Write for Special Listing No. 20.

WELLS SALES, INC.

320 N. La Salle St., Dept. P-6
Chicago 10, Illinois

HUSKY COMPOUND VISE "The Vise for a Thousand Jobs"



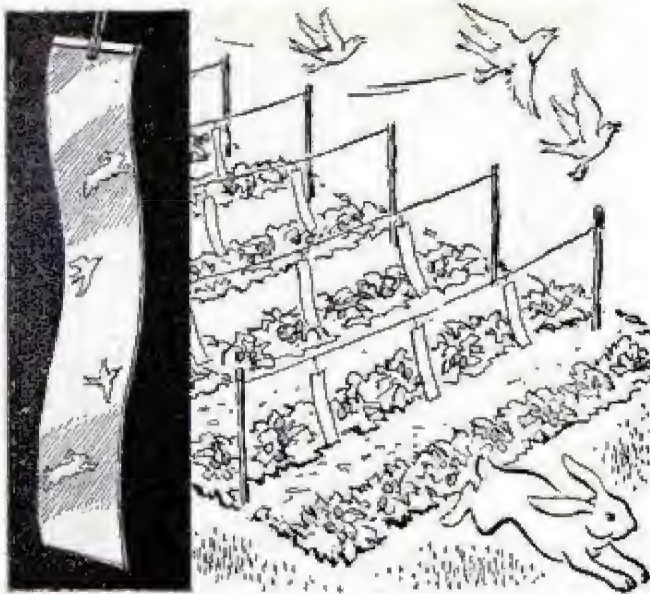
DOUBLE YOUR INCOME on welding jobs
by doing them to perfection in half the
time! This is a sturdily constructed set of
twin vises, swivel-mounted, with the right-
hand vise on screw feed longitudinal and across. The
Husky Compound Vise is EXTREMELY FLEXIBLE. Vises can
be placed in practically any desired position. SAVE THE
COST OF EXPENSIVE MACHINERY for cutting key seats,
shaping iron, surface grinding, and light milling. SAVE
the time and money needed to make expensive jigs. NO
LIMIT to its uses in the shop! It's as convenient as an ex-
tra hand! Length of bed: 33". Weight: 180 lbs. Vise jaws
open to 4 3/4" x 4". Send for free illus-
trated literature showing you how to do
jobs for only a few dollars with the Husky
Compound Vise that ordinarily require
expensive machinery.

\$60⁷⁵

HUSKY MACHINE CO.

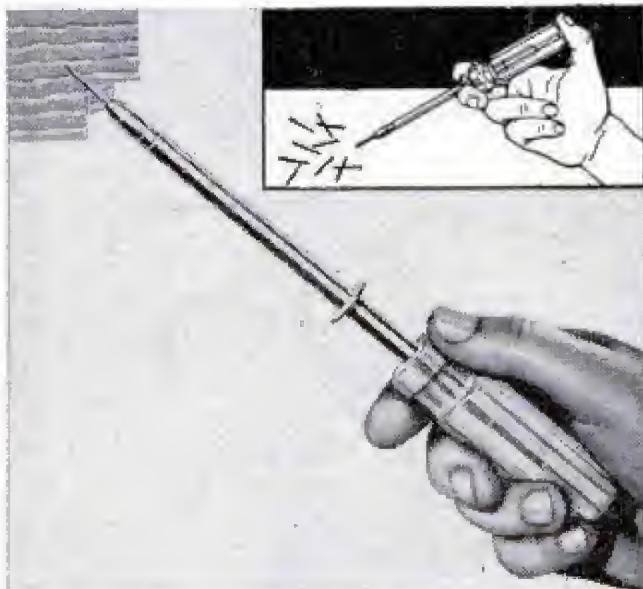
WARROAD, MINN.

Metal Strips Frighten Garden Pests



"Scarecrows" in the form of thin aluminum strips frighten birds, rabbits and other garden pests by fluttering in the breeze to give off flashes of light and a tinkling noise. The strips are 15 inches long and are hung on a cord suspended from sticks. Fruit crops can be protected by tying the noise-making strips in the branches of the trees.

Magnetic Tool Drives Brads With One Easy Push



There's no danger of bending brads or marring woodwork when a magnetic tool that pushes them in straight and counter-sinks the heads is used. All brads up to one inch in length are driven with only one push on the handle. The narrow shank permits use in corners and other hard-to-reach places. The magnetic head holds the brad in the end of the tool.

A collage of various images and text related to Baltimore. At the top left, there is a checkered pattern. In the center, there is a statue of a man in a top hat. To the right of the statue, there is a photograph of a city skyline. Below the statue, there is a sign that reads "Visitors never forget rows of white, scrubbed, gleaming marble steps." To the right of the statue, there is a sign that reads "Johns Hopkins - renowned medical research and education center." Below the statue, there is a sign that reads "The first monument in memory of George Washington, at Mt. Vernon Square." To the right of the statue, there is a sign that reads "In sight of Fort McHenry the Star Spangled Banner was written." At the bottom, there is a photograph of a city skyline with a ship in the foreground. Below the photograph, there is a sign that reads "Baltimore's Skyline. Ships from all over the world unload their rich cargoes at this gateway to the Chesapeake Bay country."

The Lords Baltimore would be proud today...

For the city, named in their honor, is one of America's busiest and most important seaports.

Going through by train or automobile, one sees little of the charm of this fascinating city — but Baltimoreans experience it every day. They know the fine art of gracious living. Rarely, in other cities, will you find one who "used to live in Baltimore," because it is too good a place to leave.

Beech-Nut Beechies

are Baltimore's favorite Candy Coated Gum

BEECH-NUT GUM in stick form is popular in all the U. S.

The first monument in memory of George Washington, at Mt. Vernon Square.

In sight of Fort McHenry the Star Spangled Banner was written.

Baltimore's Skyline. Ships from all over the world unload their rich cargoes at this gateway to the Chesapeake Bay country.

BUILD YOUR OWN DISAPPEARING STAIRWAY



SAVE
With

MYER-LEE
DISAPPEARING
STAIRWAY
HARDWARE
COMPLETE SET
\$29.75

SHIPPING Wt. 20 lbs.
COMPLETE
INFORMATION
FURNISHED

- EASY TO BUILD
- EASY TO INSTALL
- EASY TO OPERATE

When ordering state
floor to ceiling height

FOLDaway STAIRWAY CO.
813 Seaboard Street
PORTSMOUTH, VIRGINIA

America's Lowest Priced TILTING BAND SAW

Engineering Features
Found Only In
Highest Priced Saws

NOW ONLY \$16.95

Practical, modern design. Accurate, smooth operation. Cuts to center of 14" circle, 2 1/2" thick. Genuine "Oilite" bearings, adjustable ball bearing blade guide. Blade tension adjustment. Safe, fully enclosed mechanism. Thoroughly proved construction, ruggedly designed of sturdy laminated plywood. Stands 24" overall. As illustrated, blade included. Immediate Delivery. Factory Guarantee. Price FOB, St. Louis. Shipping weight 14 lbs.

Dealers Solicited Inquiries

THE JAY-KAY COMPANY
P.O. BOX 234
KANSAS CITY, MO.

PIPE CENTERS for Lathes



Fit head or tail spindles.
Centers revolve on shank.

No.	For Pipe	Shank Req'd	Price
2160	1/2" to 3"	2172-NR	\$4.50
2161	3" to 5"	2172-TH	6.00
2162	5" to 8"	2173-TH	9.00
Shank 2172-NR			No. 2 Taper \$4.50
Shank 2172-TH			No. 3 Taper 4.50
Shank 2173-TH			No. C Taper 7.50

f. o. b. factory

SOUTH BEND LATHE WORKS

455A E. Madison St.
South Bend 22, Ind.

LAUGH AT FLAT TIRES



When that tire goes flat don't worry or lose your temper. Just place the ROLAWAY in front of the flat—drive onto it and continue on to the nearest service station. In use on toll bridges and tunnels where traffic must move fast. A necessity for all motorists. Sells on sight. Retails for \$23.85. Distributors' price \$14.50 FOB Chicago.

ROLAWAY DISTRIBUTORS

Suite B07, 30 N. LaSalle St. Chicago 2, Illinois

FAST CUTS FOOD COST
NETS \$9 A CASE
SALES
SELL 6 DAILY

JELD Ltd., Burbank, California Dept. J

Make your STOP LIGHT SHOUT!

AMAZING STOP LIGHT FLASHER!

Make Your Stop Light Flash 115 Times Per Min.

A SENSATION! Automatic. Instant acting when foot brake applied. Attracts attention. Warns car behind. Non-Rusting. Dust, Oil, Vapor and Waterproof. Used by police and fire depts. Attach in 5 min. Approved by leading safety engineers.

FREE WITH ORDER, "HOW TO SAVE MONEY ON CAR 'Motoring Hints' BOOKLET." ACT NOW! If dealer can't supply send \$3.00 cash or M.O. We pay postage.

MACCHI & CO.
Dept. MJ
927 Larkin St. San Francisco, Calif.

"STOP-IT" makes stop light flash 115 times per min.

Woodworkers!!
Make your circular saw the
most versatile tool you own!

CUT GROOVES LIKE THIS

\$4.95
SET

POSTPAID
INCLUDING TAX

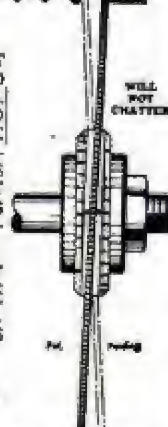


WARREN DADO SAWING WASHERS WILL FIT THE ARBOR OF ANY POWER CIRCLE SAW AND CAN BE USED WITH ANY DIAMETER SAW BLADE. . . CUTS GROOVES CLEANER, EASIER AND FASTER THAN DADO CUTTER ON THE MARKET. . . MICROMATIC ADJUSTMENT PERMITS A CUTTING ANGLE CHANGE IN 15 SECONDS. . . SAW BLADE HELD RIGID. . . WILL NOT CHATTER. . . WARREN DADO SAWING WASHERS CAN BE LEFT ON THE ARBOR OR QUICKLY REMOVED FOR CUT OFF SAWING.

... ORDER YOUR SET OF FOUR WASHERS TODAY. TRY THEM FOR TEN DAYS, IF NOT SATISFIED, YOUR MONEY WILL BE REFUNDED IN FULL. DEALER INQUIRIES INVITED



DADO SAWING WASHERS
Warren



Arbor ☐ 1/2 ☐ 3/4 ☐ 1 ☐ 1 1/2
 Sizes ☐ 1/2 ☐ 3/4 ☐ 1 ☐ 1 1/2
☐ Free Circular
☐ Check
☐ Money Order

Gentlemen: Please send _____ sets of sawing washers.
 Name _____
 Address _____
 City _____ State _____
 ALL SETS SHIPPED POSTPAID

WARREN DADO SAWING WASHERS CO.
P. O. BOX 98 NORTH END STATION
DETROIT, MICHIGAN

SAY YOU SAW IT IN POPULAR MECHANICS

Aero-Tone Rear Seat Car Radio Speaker only \$8.50

POST
PAID



(Postage and handling
extra on C.O.D. orders)

**EQUAL IN EVERY
WAY TO UNITS
COSTING UP TO \$25**



**Quickly, easily
installed...MONEY-
BACK GUARANTEE**

Aero-Tone brings new pleasure from car radios. Three-way switch lets you use rear speaker only, front speaker only, or both speakers together. All passengers can hear clearly on low volume. No front seat speaker blast. Send for this new, sensationally low-priced kit. Install it yourself in a few minutes. Test it. Five-day money-back guarantee. Send \$8.50 now or order C.O.D. Write for free literature.

AERO DISTRIBUTING CO.

P. O. BOX 2057, DETROIT 31, MICH.

**COMPLETE
SAIL BOAT
\$69.90**



8 FT. PRAM BOAT

Easily assembled in few hours. Holds 5 persons — It's a Row-boat — Sailboat — or Outboard. Waterproof plywood 8' x 4' x 15" only 75 pounds. Boat Kit \$34.95. Sail-rig \$34.95. Floorboards \$5.00 extra all job factory.



\$34.95

**LIGHT
STRONG KAYAK**



\$14.95

Wood Frame. Canvas Cover. All parts supplied.

8' 3" Kayak \$14.95. 12' Kayak \$24.95. 10' Kayak \$26.50. Sail-rig \$34.95 extra.

Send Check or Money Order. All Kits ship and express collect.

**TIMELY
PRODUCTS CO.**
Arlington 74, Mass.



**Easy and
Cheap to
Operate**

SAVE TIME, WORK, MONEY!

**SHAW
DU-ALL**

and "PEPPY PAL" TRACTORS

PLOW



CULTIVATE



MOW



RIDE



**SHAW
MFG. CO.**

These rugged walking or riding tractors ideal for farm, truck garden, orchard, poultry farm. They operate on a few cents an hour. A child can handle them.

DO DOZENS OF JOBS

The Shaw Du-All or Peppy-Pal does many jobs quickly and easily. Plows, cultivates, harrows, disks, bulldozes, sprays, hauls, grinds, and saws wood.

BUILT FOR RUGGED WORK

Sturdy, extra-strength construction means low upkeep, long life. Full year's guarantee.

LOW FACTORY PRICES

Buy direct or through your dealer! Almost anyone who owns a garden can afford a Shaw Du-All or Peppy Pal. Mass production holds prices down — quality up.

RIDING TRACTORS

4 models, from 5 to 12 1/2 H. P., 58 in. wheel-base, 36 in. wide, 24 in. plant clearance. Hand or electric starter. Improved steering device, brakes enclosed in differential housing. Heavier frame and bearings. Standard hitch for trailers and wagons. Plow, harrow, cultivator, cutter bar, snow plow, bulldozer available.

FREE: Illustrated folders giving complete details and price lists—write today!

**4506 Front St., Galesburg, Kan.
668-G North 4th St., Columbus, O.**



**Nationally Known
SILVER SEAL
Rebuilt Engines
SHIPPED TO ALL PARTS
OF THE WORLD**

PRECISION REBUILDING AND EXPERT CRAFTSMANSHIP make the nationally known Silver Seal engine the outstanding rebuilt engine in the automotive industry.

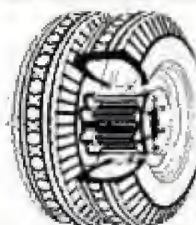
MOST LIBERAL WRITTEN GUARANTEE ever offered on any engine—new or rebuilt.

FULL ALLOWANCE ON OLD MOTOR if not cracked or welded, no charge off for excessive wear, etc.

YOU PAY VERY LITTLE MORE, YOU GET A LOT MORE.

Make	Exchange Price	Trade-In Deposit
FORD Mod. A & B	96.50	28.00
FORD V8 all	108.50	48.00
CHEV. 6 cyl., all	96.50	28.00
PLYM. 6 cyl., all	118.00	20.00
DODGE, CHRYSL., DE SOTO	124.50	35.00
All 6 cyl. PONT., OLDS, STUDE, NASH, PACKARD, HUDSON	134.50	45.00
All 8 cyl. BUICK, PONT., OLDS, STUDE NASH, PACKARD, HUDSON	159.50	40.00

If old engine does not accompany order—add trade-deposit to exchange price. Deposit will be promptly refunded upon receipt of your old engine.



**Du-All Converters \$28.50
for Dual Wheels . \$28.50**

You can install Dual wheels on your Farm Wagon, Trailer, Pick-up Truck, or Jeep in less than ten minutes. Du-All Adapters eliminate expense of changing to truck-type wheels and hub. Use your spares for duals! Guaranteed to do the job or your money back.

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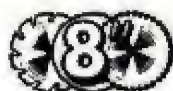


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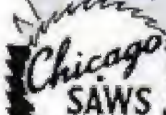
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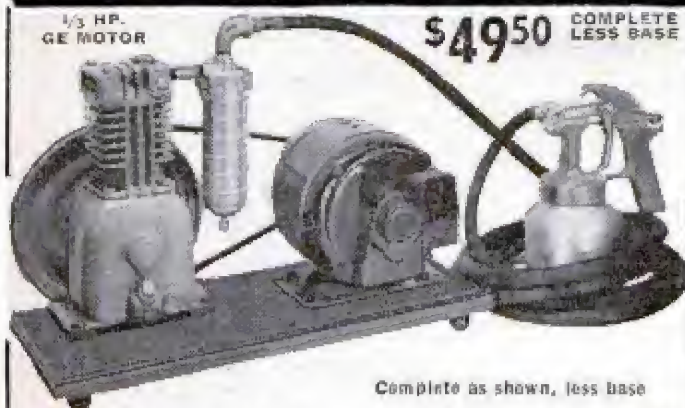
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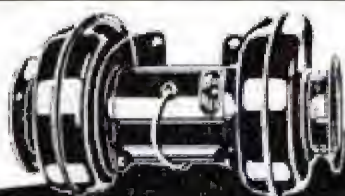
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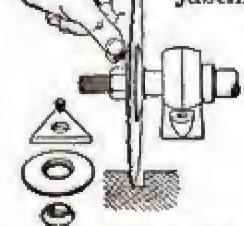
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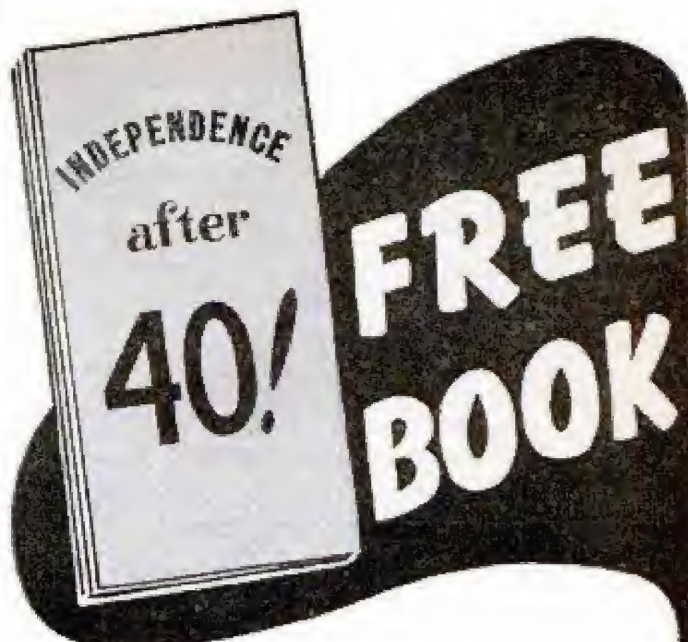
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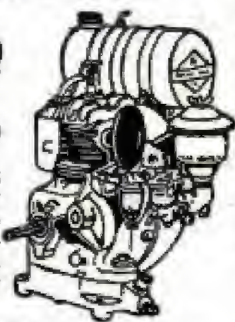
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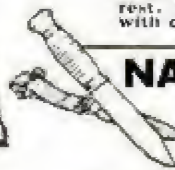


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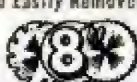
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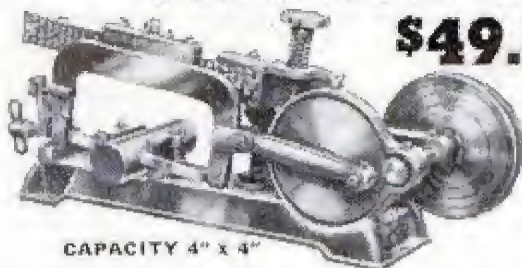
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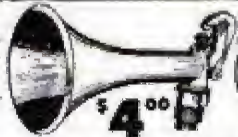
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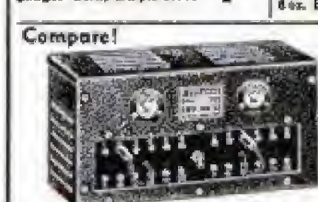
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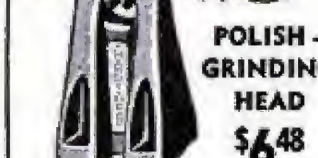
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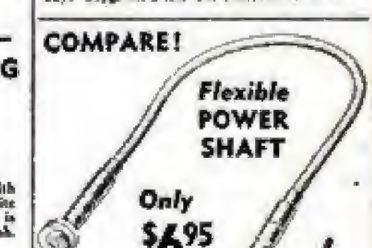
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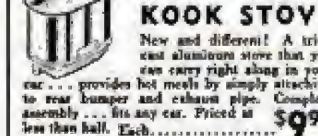
Takes standard accessories. Equipped with needle bearings and 1/4 in. Jacobs Hand-Tite Chuck. 1/2 in. shaft of cold rolled steel. Frame is one piece cast aluminum. Red enamel finish. Height 6 in. Shpg. wt. 6 lbs.



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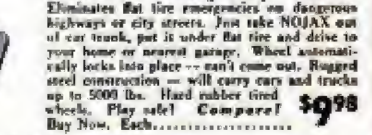
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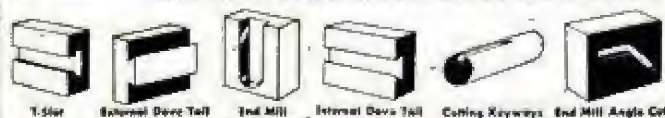
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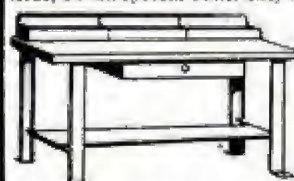
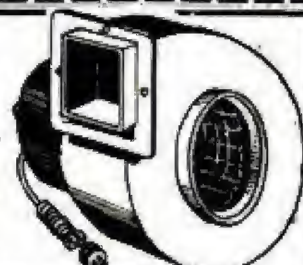
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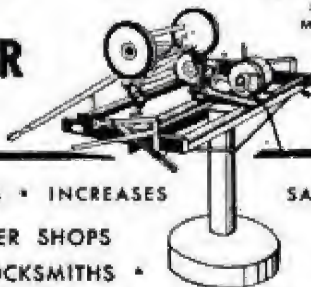
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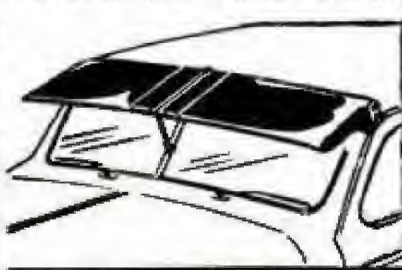
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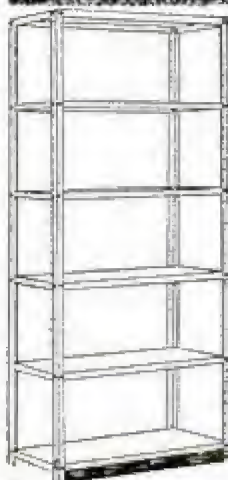
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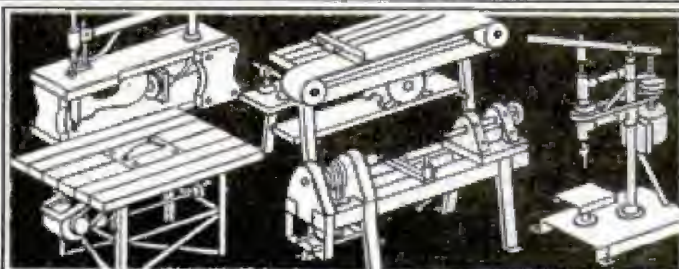
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MAKE YOUR OWN POWER TOOLS FROM SCRAPS, SAVE HUNDREDS OF DOLLARS

Complete constructional details on five sturdy power tools you can make at small cost from old auto parts, pipe fittings, wood, etc. PRECISION DRILL PRESS, WOOD LATHE, HIGH SPEED JIGSAW, LARGE CAPACITY BELT SANDER, CIRCULAR SAW WITH EXTRA LARGE TABLE. Set of five easy-to-follow plans only \$2.00 postpaid. Clip this ad and mail with check or currency TODAY. Money-back guarantee.

CRAFTPLANS, Dept. P-120, 7241 Madison, Kansas City 5, Mo.

BALL BEARING STEEL WHEELS

Complete With Wheels, Tires & Bearings

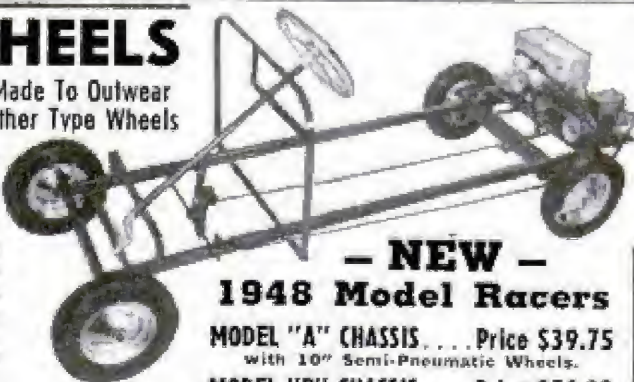
Made To Outwear
Other Type Wheels

SIZE	TIRE	BEARINGS	LOAD	ONE	TWO	FOUR
12"x2½"	Semi-Pneumatic	Ball ½" or ¾"	150 lbs.	\$ 5.50	\$10.00	\$18.00
12"x2½"	Semi-Pneumatic	Ball ½" or ¾"	225 lbs.	\$ 6.00	\$11.00	\$20.00
12"x3"	Semi-Pneumatic	Ball ½"				
		Bronze ¾"	340 lbs.	\$ 7.00	\$13.50	\$26.00
10"x1¾"	Semi-Pneumatic	Ball ½" or ¾"	125 lbs.	\$ 3.00	\$ 5.50	\$10.00
10"x2½"	Semi-Pneumatic	Ball ¾"	250 lbs.	\$ 5.50	\$10.00	\$18.00
8"x1½"	Solid	Ball ¾"	640 lbs.	\$ 8.00	\$15.00	\$29.00
6"x2"	Solid	Ball ½"				
		Bronze ¾"	340 lbs.	\$ 4.00	\$ 7.50	\$14.00
4.00"x8"	Pneumatic					
	16" O.D.	T.R. 1"	700 lbs.	\$13.50	\$26.00	\$50.00
5.00"x8"	Pneumatic					
	16" O.D.	T.R. ¾"	700 lbs.	\$15.50	\$30.00	\$59.00

The above Pneumatic Wheels are Complete With Wheels, Bearings, Tires and Tubes — 4 Ply Tires for ¾" and 1" Straight Axles. (Also 18", 21" and 23" High Speed Auto Type Wheels.)

SEND 10c FOR CIRCULAR: On Power Racers, Steering Wheel Assemblies, Auto Type Axles, Parts, Sulkies, Etc.

OSBORN WHEEL COMPANY, 115 So. Main St., Dept. P-6, Doylestown, Penn.



— NEW —

1948 Model Racers

MODEL "A" CHASSIS... Price \$39.75
with 10" Semi-Pneumatic Wheels.

MODEL "B" CHASSIS... Price \$56.00
(shown above) 12" Semi-Pneumatic Wheels.

MODEL "D" CHASSIS... Price \$139.50
with 5.00"x8" (16" dia.) Pneumatic Wheels.

Less Engines and Transmissions

Also sold Complete With 1 H.P.
to 6.6 H.P. Gasoline Engines

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Add 10% for
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New Direct Mail Plan Saves You Big Money!



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in a Giffy!*

**DE LUXE QUALITY SCOTCH PLAID
Fibre AUTO SEAT COVERS**

Sedans
and Coaches
COMPLETE SET
Front
and Back
Seat **\$7.98**
POST
PAID

For Coupes and
All Front Seats
Unbeatable
Low
Price **\$3.98**
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Fits most Cars!

- Check These QUALITY Features**
- ★ Colorful, Water Repellant Scotch Plaid Fibre
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Check YOUR CHOICE OF Front Seat STYLE



A SOLID BACK
For 4-door
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**SOLD ONLY
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For Coupe or
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We challenge comparison because nowhere... but nowhere will you get these fine seat covers at our low price! Yes, thanks to our amazing direct-from-distributor-to-you plan, you can now own long-wearing DeLuxe Auto Seat Covers at much lower prices than you'd expect to pay. And don't let our low price lead you to confuse our fine covers with other auto slip-covers being sold elsewhere. No indeed! These are top quality, DeLuxe Seat Covers master-tailored of rugged, water-repellent scotch-plaid fibre and richly grained leatherette. Their smooth fit and handsome appearance will vastly improve the looks of your car, make it easy for you to slide in and out, protect your clothing and upholstery, and check driving discomfort. **SEND NO MONEY**... pay postman \$3.98 plus postage or send cash and we pay postage. If not completely delighted return within 5 days for refund under our **you must be pleased — or money-back guarantee!**

American Merchandising Co., Dept. SC113, 9 Madison Ave., Montgomery 4, Ala.

Please send me the DeLuxe Seat Covers for car checked off below Price in Canada add 50c. No C.O.D.'s

Make _____ Model _____ Year _____

FRONT SEAT TYPE—A _____ B _____ C _____

CHECK ☐ I am enclosing \$_____ in full payment. Send Postpaid.

ONE ☐ Send C.O.D. I will pay postman \$_____ plus postage

Name _____

Address _____

City _____ Zone _____ State _____

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FAST FREEZER**

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\$1**

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5 sizes
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IT'S FUN — IT'S EASY — IT'S PROFITABLE — AN IDEAL GIFT
Exquisitely Designed Ebony Black Plastic Case. Precision Made for Dependable Accuracy. Complete. Ready to Assemble.

MAKE EXTRA MONEY DURING YOUR SPARE TIME by assembling and selling this distinctive pendulum clock to friends and neighbors.

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IT TICKS

IT CLICKS



Build this Clock Yourself for

ONLY \$3.95 POST-PAID

MOTHERS AND DADS. Here's an educational and practical clock building project that your boy (or girl) will enjoy and at the same time secure valuable and worthwhile mechanical knowledge. Watch him glow with pride as he builds his first clock... and you'll be proud too, and a little breathless at the amazing result.

NO SPECIAL TOOLS REQUIRED. A small screwdriver is the only tool required. Complete, easy-to-read directions furnished.

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Dear Sir: Please send me _____ Wilcox, "build-a-clock" sets at \$3.95 each.

____ Check or M. O. Enclosed ____ Send C. O. D. plus postage

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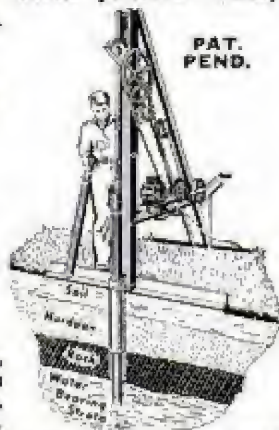
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The "CONSOL" Well Driller with IMPROVED DRILL HEAD with removable insert at point will drill through many feet of rock without resharpening. Do the work yourself—easily, quickly, inexpensively.

Sturdily Made
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F.O.B. Factory less Motor



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Drill outside—in the cellar—in the barn!

Dept. PM



CONSOLIDATED INDUSTRIES
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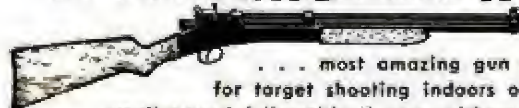
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"Bullseye" Adjustable "power without

powder" for accuracy with safety indoors and out! No noise, no recoil, no odor, no cleaning! Perfect balance!

Rifled barrel! Fine gunsmithing! Low cost! THAT'S what you get in this new .177 cal. single-shot pistol of regulation target type and weight. Shoots Crosman Super-Pells at 1/4 cent per shot. No wonder they say no other pistol provides so much fun at such small cost. At your sporting goods or hardware dealer's... or write direct.

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... most amazing gun ever invented for target shooting indoors or out and for small game! Adjustable "power without powder" ... no noise, recoil, odor or cleaning. Rifled barrel. Shoots low-cost Super-Pells. .177 or .22 cal. single-shot or magazine models. At your dealer's... or write direct.

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New! BLACK & DECKER

HOME-UTILITY
1/2 INCH
ELECTRIC DRILL



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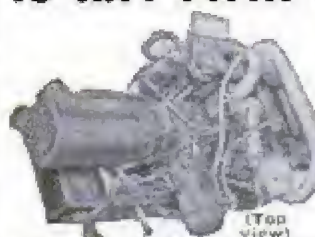
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A.W.G. size 8 to 19.....	\$1.00 per lb.
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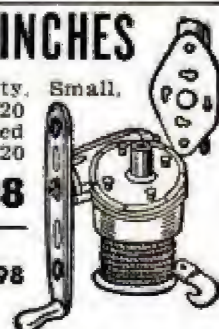
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Send ck. or M. O. Please no COD's.

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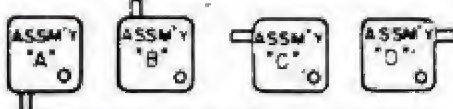


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When ordering be sure to specify assembly and ratio required. Shipping weight in carton 8 1/2 lbs. Prompt delivery. Full Money Back Guarantee.



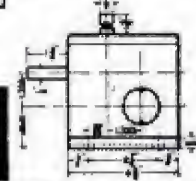
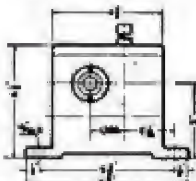
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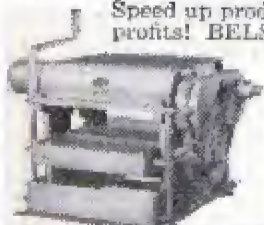
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BELSAW Multi-Duty Planer

Speed up production! Increase your profits! BELSAW power self-feeds at 24 feet per minute...



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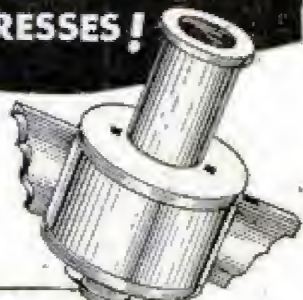
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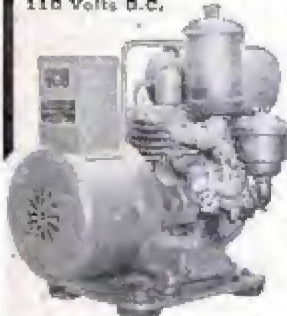
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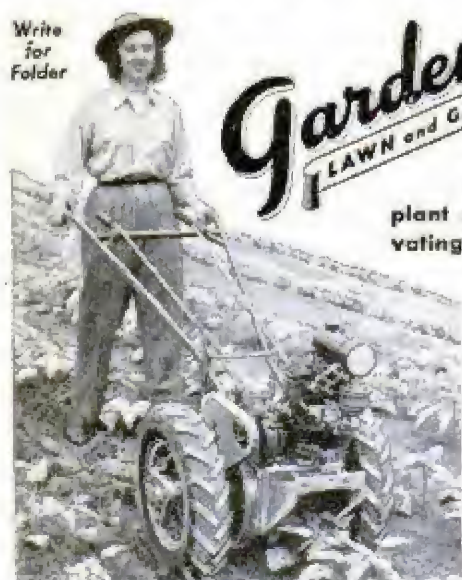
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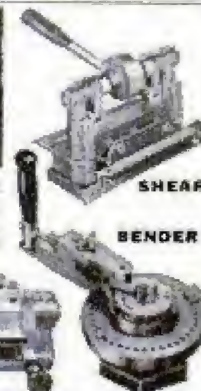
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10" with 1½" KILIAN BALL BE'GS, and 1.75 semi-pneumatic tire, ea. 2.29

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STEELS and ALUMINUMS with a motorboat tone

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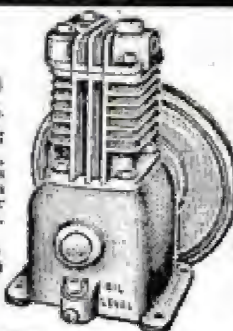
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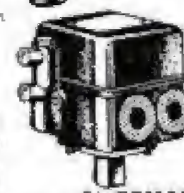
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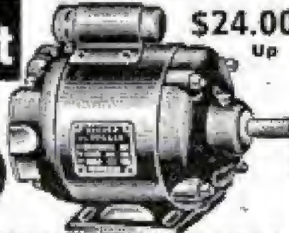


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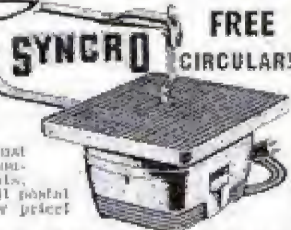
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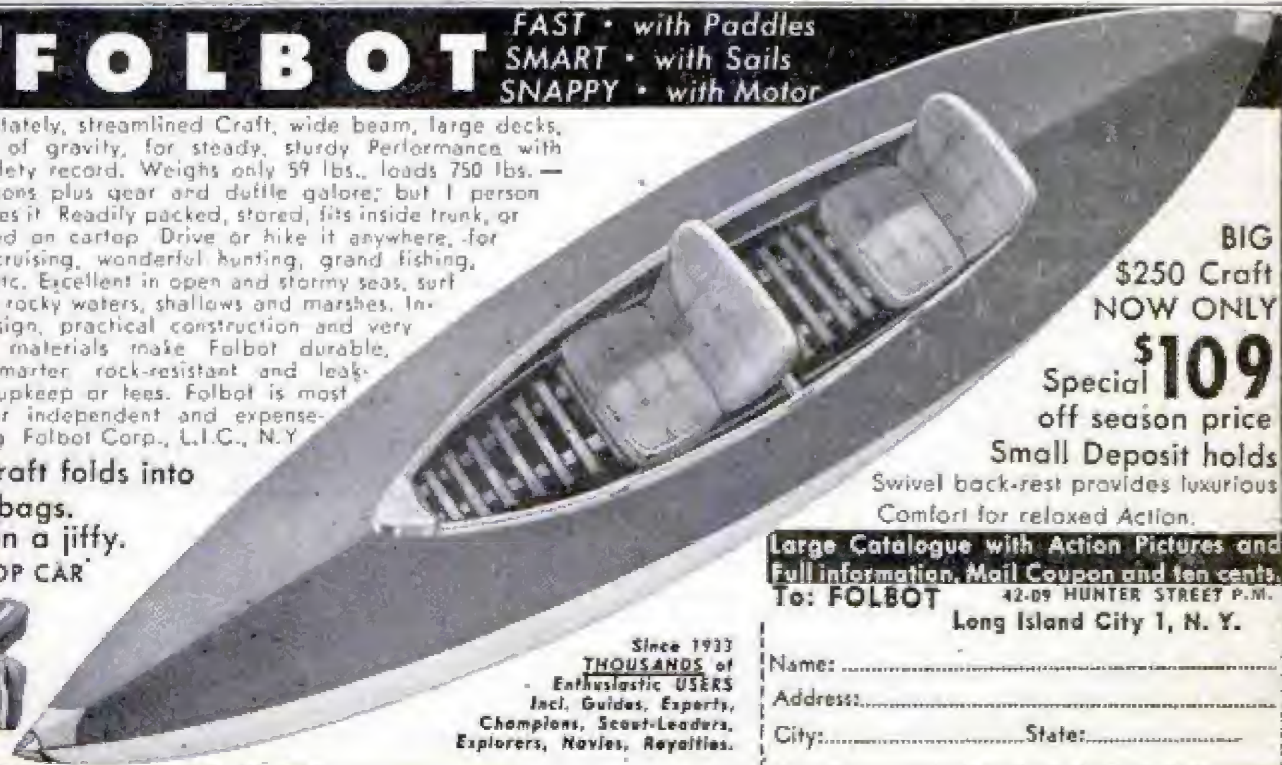
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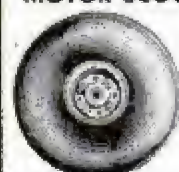
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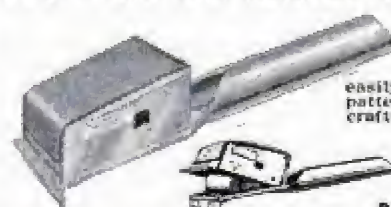


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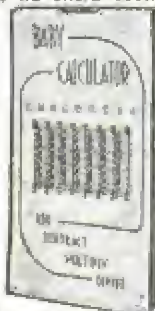
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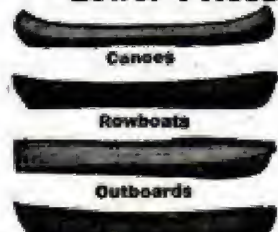
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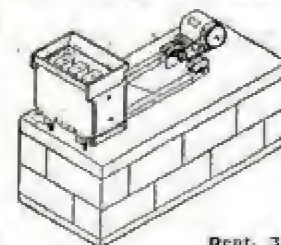
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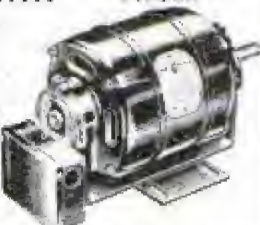
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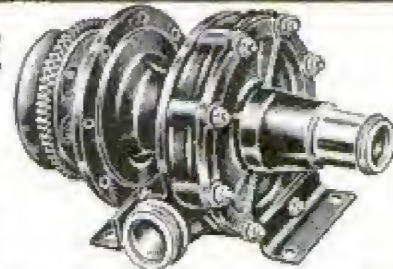
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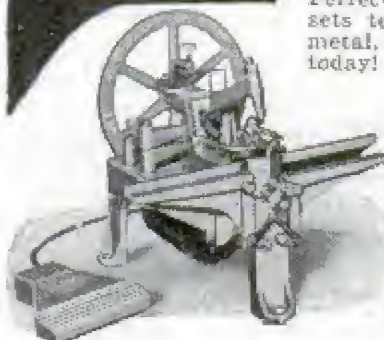
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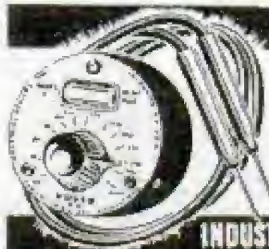
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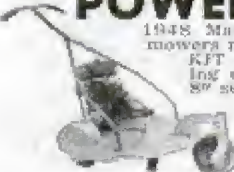


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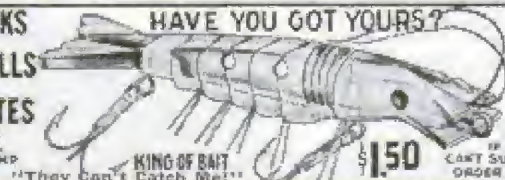
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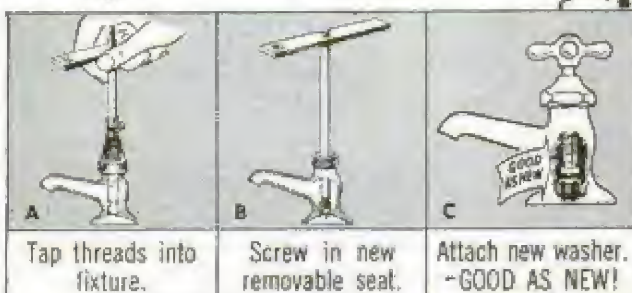
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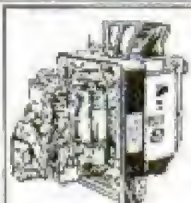
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Complete with a genuine leather scabbard.

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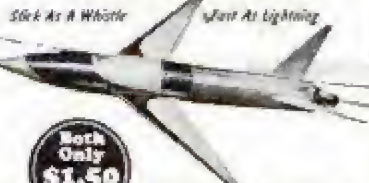
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JUNE 1948

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Talk or listen from Master Station to any one of 5 sub-stations or from any sub-station to master

This exceptional unit was built to U. S. Army Signal Corps specifications at an original cost to the government of over \$225. Several new features have been added during its conversion. Now it does the same job as a \$500 to \$1000 intercommunication system installation.

Unit consists of 1 master amplifier, one combination microphone speaker and 100 feet of wire. You can talk or listen to any one station or all stations at one time as you desire. Any one station or call station can talk back or originate a call to the master station from as far as 75 ft. away without switching the sub station. As many as 5 sub stations can be used in your system. Each station will furnish clear tones from as far as 20 feet to 5 miles distance. Very simple installation.

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Additional sub stations

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Shoots a high pressure stream 30 feet!

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Enclosed find ☐ check ☐ money order.

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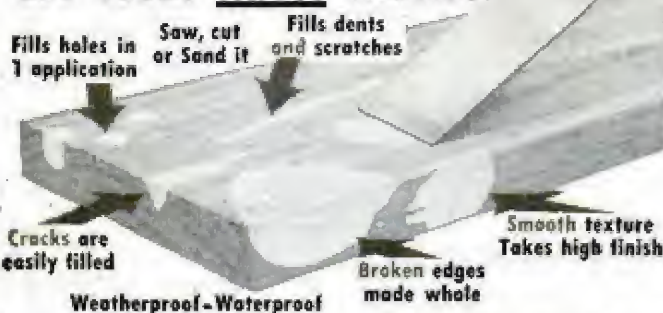
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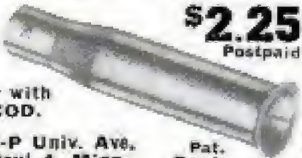
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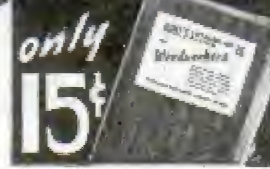
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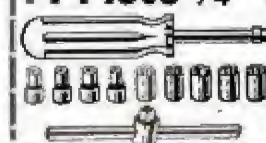
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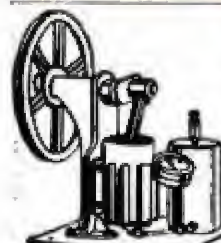
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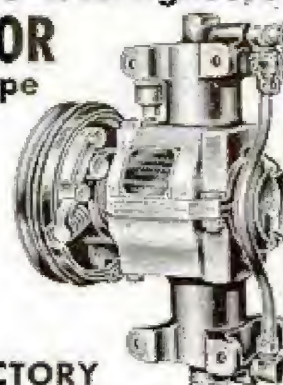
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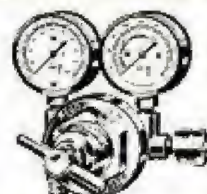
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Amazing MOTO-SANDER Saves Time - Saves Effort

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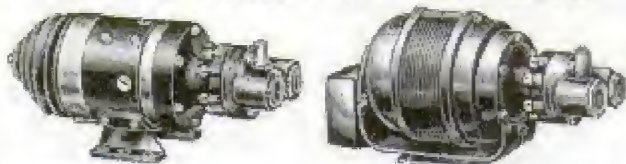
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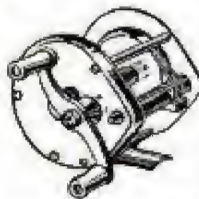
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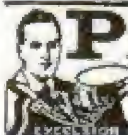
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Complete With Handle and Clutch, **LESS MOTOR**. Bright Red Enameled, many new, some demonstrators with less than 8 hrs. use. Easily converted to gas or electricity. Stogie spiral full 20" cutting blade, adjustable to various cutting heights. Supply limited—order today.

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Double Chemical Cartridge PAINT RESPIRATOR

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Industrial painters' respirator at less than manufacturer's cost. War Surplus. Plenty of space for breathing. Price includes facelet and two extra valve discs. Also effective against low concentrations of creosote, gasoline, naphtha, kerosene, various grain dusts, etc. Extra Chemical Cartridges, 4 for \$1.20. Send check or M. O. Add 10% for Postage. Tested, B. of M. approved, nationally known respirator. Not a gadget.

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KANSAS CITY, MO.

GENERAL ELECTRIC RT-1248 15-TUBE TRANSMITTER-RECEIVER

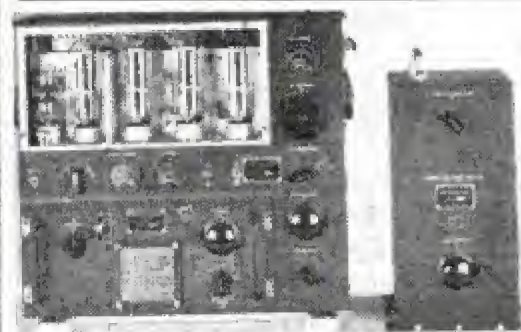
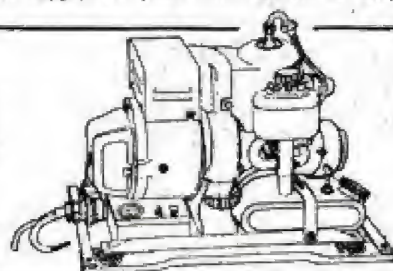
TERRIFIC POWER — (20 watts) on any two instantly selected, easily pre-adjusted frequencies from 435 to 500 Mc. Transmitter uses 5 tubes including a Western Electric 316 A as final. Receiver uses 10 tubes including 955's, as first detector and oscillator, and 3—7H7's as IF's, with 4 slug-tuned 40 Mc. IF transformers, plus a 7H7, 7E6's and 7B7's. In addition unit contains 8 relays designed to operate any sort of external equipment when actuated by a received signal from a similar set elsewhere. Originally designed for 12 volt operation, power supply is not included, as it is a cinch for any amateur to connect this unit for 110V AC, using any supply capable of 400V DC at 135 MA. The ideal unit for use in mobile

or stationary service in the Citizen's Radio Telephone Band where no license is necessary. Instructions and diagrams supplied for running the RT-1248 transmitter on either code or voice in AM or FM transmission or reception, for use as a mobile public address system, as on 80 to 110 Mc. FM broadcast receiver, as a Facsimile transmitter or receiver, as an amateur television transmitter or receiver, for remote control relay hookups, for Geiger-Mueller counter applications. It sells for only **\$29.95** or two for **\$53.90**. If desired for marine or mobile use, the dynamotor which will work on either 12 or 24V DC and supply all power for the set is only **\$15.00** additional.

PE-109 32-VOLT DIRECT CURRENT POWER PLANT

This power plant consists of a gasoline engine that is direct coupled to a 2000 watt 32 volt DC generator. This unit is ideal for use in locations that are not serviced by commercial power or to run many of the surplus items that require 32V DC for operation. The price of this power plant is only **\$58.95**. We can also supply a converter that will supply 110V AC from the above unit or from any 16-32V DC source for **\$12.95**.

(Due to the fact that the PE-109 comes to us sealed in heavy steel strapped govt. cases we are unable to determine whether the individual units are new or used or what the condition is if used, and consequently must sell them as is. In general, they represent a terrific bargain.)



GENERAL ELECTRIC 150 WATT TRANSMITTER

COST THE GOVERNMENT \$1800.00

COST TO YOU BRAND NEW \$67.50!!!

This is the famous transmitter used in U.S. Army bombers and ground stations, during the war. Its design and construction have been proved in service, under all kinds of conditions, all over the world. The entire frequency range is covered by means of plug-in tuning units which are included. Each tuning unit has its own oscillator and power amplifier coils and condensers, and antenna tuning circuits—all designed to operate at top efficiency within its particular frequency range. Transmitter and accessories are finished in black crackle, and the milliammeter, voltmeter, and RF ammeter are mounted on the front panel. Here are the specifications: **FREQUENCY RANGE:** 200 to 500 KC and 1500 to 12,500 KC. (Will operate on 10 and 20 meter band with slight modification.) **OSCILLATOR:** Self-excited, thermo compensated, and hand calibrated. **POWER AMPLIFIER:** Neutralized class "C" stage, and equipped with antenna coupling circuit which matches practically any length antenna. **MODULATOR:** Class "B"—uses two 211 tubes. **POWER SUPPLY:** Supplied complete with dynamotor which furnishes 1000V at 350 MA. Complete instructions are furnished to operate set from 110V AC. **SIZE:** 21 1/2 x 23 x 11 1/4 inches. Total shipping weight 200 lbs., complete with all tubes, dynamotor power supply, seven tuning units, antenna tuning unit and the essential plugs.

1948 MODEL OUTBOARD MOTOR at Dealer Wholesale Price!!

Powerful deluxe twin cylinder outboard motor with automatic starter (no fumbling for a rope), a positive cooling unbreakable water pump, and an improved magneto for sensationally quick starts as well as smooth, efficient operation at slowest trolling speed or with the throttle wide open. Dozens of additional outstanding features are provided, such as corrosion resistant aluminum alloy castings, to protect the engine and give the unit a sleek, streamlined appearance; hardened alloy steel connecting rods with roller bearings; and a rugged, perfectly balanced crankshaft. Delivers a full 7.5 H.P., as rated by the Outboard Boating Club of America. Net weight—32 lb., gross shipping weight including free steel storage stand—100 lb. For a limited time we are selling this motor, which is produced by the world's second largest maker of outboards to sell for more than \$300.00 above our price — for only **\$139.00**, FOR BUFFALO.

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1. AUDIO AMPLIFIER Undreamed of value. Uses 6V6's. Has 4 microphone inputs brought to jacks at rear panel. Various output impedances available at rear panel connections. Steel case with chrome handles. 9" long x 9" high x 6" deep. Tubes included. New in original carton. Shipping weight 20 lbs. **SUPER SPECIAL—\$4.95** while supply lasts.

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ORDER NOW — DON'T DELAY

Minimum order \$3.00 — All prices subject to change — 25% deposit with C.O.D. orders.

Terrific Value — Portable Electric Drill (Sold at less than established factory price so we cannot mention brand name)

Only **\$19.95** equipped with 1/2" Jacobs Geared Chuck and Key. Not an intermittent duty drill, but a full size rugged tool. Most convenient type switch, natural grip handle, and balance like a six shooter.

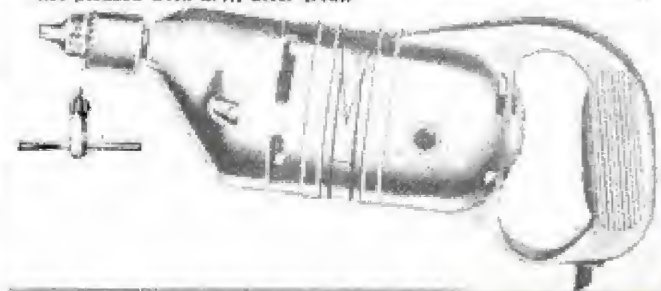
Precision cut gears — turbine type cooling blower — extra long brushes.

No stalling under heaviest pressure because of powerful 110 Volt AC-DC motor and multiple ball thrust bearing.

Other bearings self-aligning lifetime-lubricated Chrysler Office type. Made for toughest year-in and year-out service in plant or on construction jobs.

Amazing perpetual factory guarantee assures you of a lifetime of trouble-free use.

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ALUMINUM GEAR BOX 18x8x7 that contains two powerful electric motors and two matched gear trains, 62 gears in all varying in size from 1/2 to 4 inches in diameter. This unit is readily converted to rotate a beam antenna or for any other similar use. **\$3.00**

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BUFFALO RADIO SUPPLY, 219-221 Genesee St., Dept. 5-M, BUFFALO 3, N. Y.

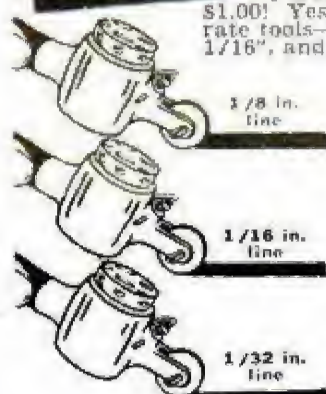


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Motor: Universal, 110 volt AC-DC, 1 1/4 HP. Speed, 18,000 r.p.m. no load. Weight, 11 1/2 lbs., height 9 inches, diameter 4 inches. Switch conveniently located on body of motor with plug-in cable.

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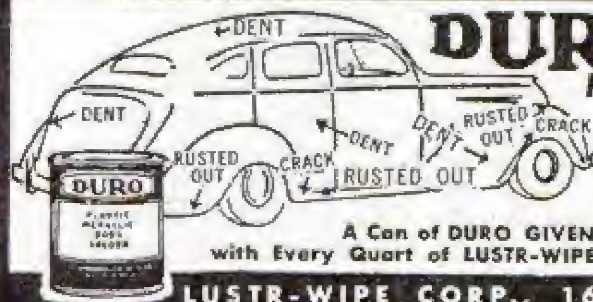
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FIXES FENDERS AND BODIES LIKE NEW



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These pumps are brand new. Original acquisition cost approx. \$100.00. Can also be used as hydraulic motor for rams, opening doors, hydraulic lifts, etc.—also for any liquid transporting job. War surplus, but brand new. Ship wgt. 7 lbs. Send check or money order. Satisfaction guaranteed. Each only.

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3/4 x 4 1/2 Spindle
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C4—1 1/2 x 12 1/2 spindle, housing 2x8 \$7.95 PP.
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C6—3/4 x 12 1/2 spindle, housing 2 1/2 x 8 \$9.25 PP.
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1 INCH BETWEEN WASHER AND COLLAR

SHAPER ARBORS 3 inches between collars, C4-1/2 \$14.25, C5-3/4 \$14.25, C6-3/4 \$15.25, D8-1 \$23.00, B25—1 x 2 1/2 cap, danger mount \$5.50, SPECIAL SAW ARBOR LENGTHS for 1/2, 3/4, 1, add \$1.50.

PILLOW BLOCKS—Ball Bearing, 1/2 \$2.50, 3/4 \$3.50, 1 \$4.25.

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HYDRAULIC, VACUUM, AIR
 For every purpose at 15% of Value.

P-1 Hydraulic Power Type
 Positive displacement gear type. Capacity: 1 gal. per min. at 1500 P. M. at 1500 P. M. S. I. Operating speed: 2750 R. P. M. Interchange maximum 4500 R. P. M. Features: either direction with slight adjustment.

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 Positive displacement angle piston type. **HYDRAULIC** Capacity: 1 gal. per min. at 3000 R. P. M. at 1500 P. M. S. I. Operating speed: 2750 R. P. M. Interchange maximum 4500 R. P. M. Retains in right only.

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 May be used as air or fuel pump for pressure or vacuum. Will pump 1 1/2 gals. oil at 100 R. P. M. Builds air pressure 10 lbs. per sq. in. at 1500 R. P. M. Vacuum draws 18 in. Hg. mercury at 1750 R. P. M.

ROMEY FUEL
 800 GPM at 30 PSI. can also be used as hydraulic for 4 GPM at 400 PSI. or for Vacuum drawing 13 in. mercury at 1500 RPM.

New Electric Motors
 #500 New 1/2 H.P. 27 Volt D. C. 24 Volt A. C. This motor can be readily adapted to 110 A. C. by the simple method of rearranging armature brush leads. We furnish free diagram of instructions with each order. A Sensational Value @ \$5.95

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#502 - 2 H.P., 24 V D.C.M. used. \$8.95

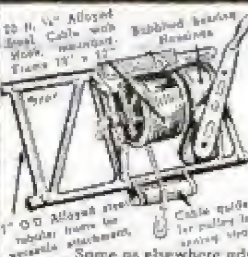
Just received new shipment of that popular 1000 lb. pressure COMPRESSOR, complete with 1 1/2 H. P., 27 V. D. C. Motor, Tank and Fittings. While they last at the old Price at

HOBBYISTS!
 An Unequaled Value!
GADGET MIX
 Rivets, spacers, Clamps, bolts, nuts, Radio parts, gears, etc.

A gold mine... \$1.19

BEARING MIX
 Needle, ball and roller bearings in excellent assortment. Sizes from 1/2" to 2". #170 Introducing this treasure chest assortment of 75 Bearings at

SPRING MIX
 Torsion, compression and tension springs. Assorted sizes. #206 2 lbs. 89c A treasure chest for emergency!



WINCH HOIST
 now equipped with mounting frame, handle, cable, etc. complete. Thousands of Satisfied Users! Handbooks have written telling us it's the most wonderful tool in the world! Capacity 2500 lbs. 20:1 ratio. Bronze Worm Gear. Ideal for Garages, Truck loading, Machine Shops, Boat Builders, etc. Our Price \$15.99

Here's a Real "Lite Special"
 Farm, Auto, New U. S. Navy Portable Pistol Grip. Sealed Beam. 12v. Search Spot, or Emergency Light. Featherweight Gov. Cost our price \$35.00
 3 Extra Users - Red. \$2.95
 Green & Amber. 93c Set

NEW FLEXIBLE GOOSENECK LAMP
 110 V. A. C. 13 H. wire with socket, switch and plug. In mounting bracket suitable for home or workshop. Wire alone worth our price of 99c each.

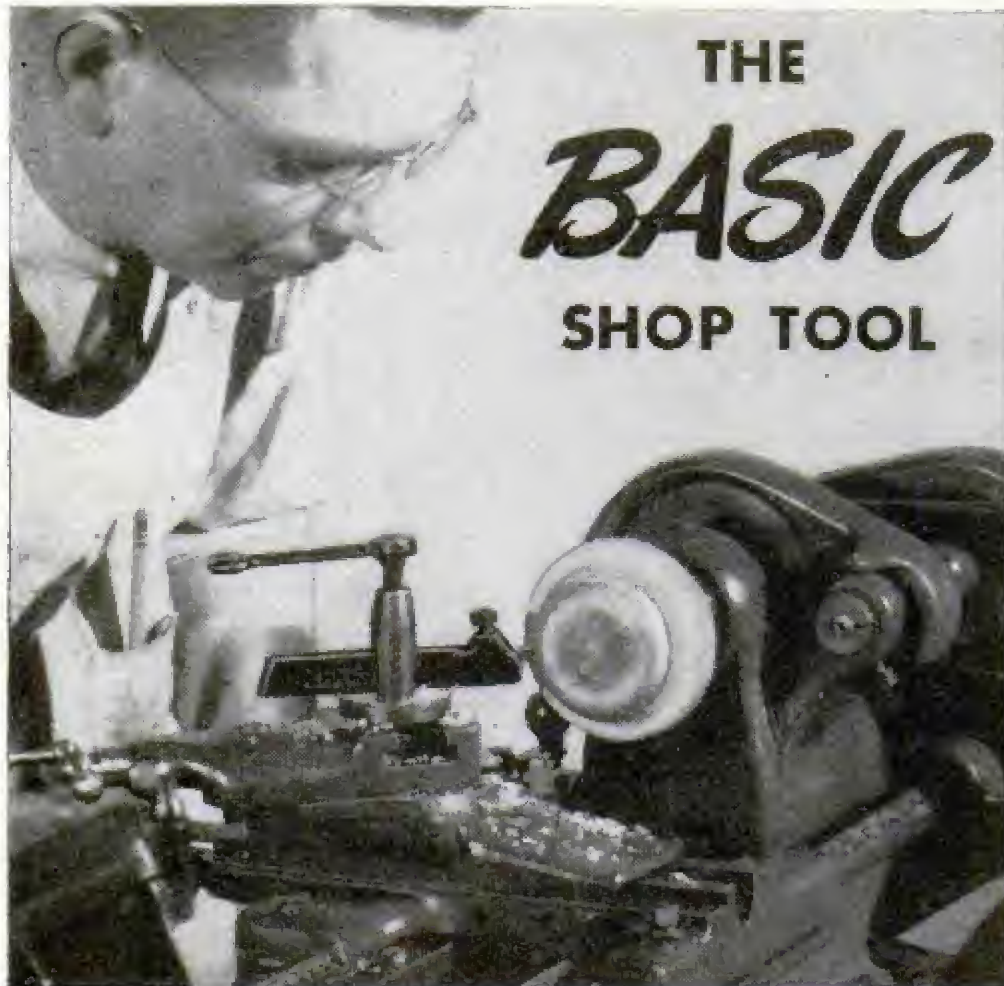
BATTERIES
 NEW FULL STRENGTH FOR PORTABLE RADIOS, SIGNAL LAMPS, BOATS, ELECTRIC TRANS, ETC.
 #516 9 Volt 8 1/2" x 6 1/4" 4 in. 79c
 3 run 27 Volt motor. These batteries are especially suited to portable radios.
 #517 67 1/2" 1 1/2" Volt Battery. 69c
 #518 90 & 1 1/2" Volt 69c

VALUABLE GEARS BARGAINS!
 8 to 1 ratio, spur drive... \$1.10 \$2.98
 6 to 1 with screw shaft... \$1.11 \$4.98
 \$5 to 1 (can be used for radio, am-fm, etc.)
 #112 \$3.95
 #113 11-1 gear ratio... \$3.95
 2 to 1 ratio 90° right angle... \$4.95
 10 tooth bevel steel boxed gear... \$4.95
 11 to 6 to 1 ratio 90° right angle... \$4.95

Flexible Gear Shafts With End Drives
 115 - 30" 69c ea.
 115a - 50" 99c ea.
 Radio tuning shafts that can be used as Box gear drives #115a 12 H. 1/2" nut - 15 tooth internal spline \$1.95 ea.
 #115b 25 H. 1/2" nut 12 tooth with internal spline \$4.25

NEW PRESSURE TANKS
 Stainless steel - Shatter proof. Handles 10,000 available in 8 different sizes. 5000 psi. C-1 12 1/2" x 24 inches - 1000 Cu. in. capacity \$4.75
 C-2 12 1/2" x 34 in. - 1000 Cu. in. capacity \$4.75
 C-3 12 1/2" x 44 in. - 1000 Cu. in. capacity \$4.75
 C-4 12 1/2" x 54 in. - 1000 Cu. in. capacity \$4.75
 C-5 12 1/2" x 64 in. - 1000 Cu. in. capacity \$4.75
 C-6 12 1/2" x 74 in. - 1000 Cu. in. capacity \$4.75
 C-7 12 1/2" x 84 in. - 1000 Cu. in. capacity \$4.75
 C-8 12 1/2" x 94 in. - 1000 Cu. in. capacity \$4.75
 C-9 12 1/2" x 104 in. - 1000 Cu. in. capacity \$4.75
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 C-241 12 1/2" x 2424 in. - 1000 Cu. in. capacity \$4.75
 C-242 12 1/2" x 2434 in. -

THE *BASIC* SHOP TOOL



9" x 3' Model C Bench Lathe—\$171.60
complete with 1/4 h.p. motor and drum switch

9" SOUTH BEND LATHE

This South Bend 9" Precision Lathe is the basic tool for your shop. It enables you to perform accurately the same full range of operations done on South Bend Lathes in industry. Also, operations ordinarily performed on other machine tools are made possible through the use of efficient attachments. You get more for your money in a South Bend 9" Lathe.

Write for Catalog 9-F or see local distributor—you will find his name under "Machine Tools" or "Lathes" in your classified telephone directory.

NEW 14" DRILL PRESS—a ruggedly built tool unsurpassed for accuracy and dependability. Prices start at \$98.00, f.o.b. factory.



SOUTH BEND LATHE WORKS

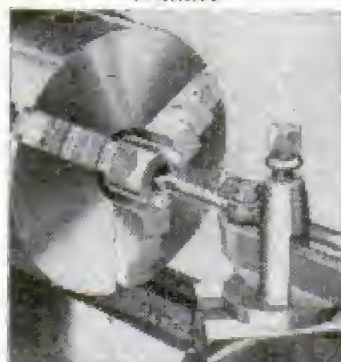
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455 EAST MADISON STREET, SOUTH BEND 22, INDIANA

A Few of the Many
Operations You Can Perform



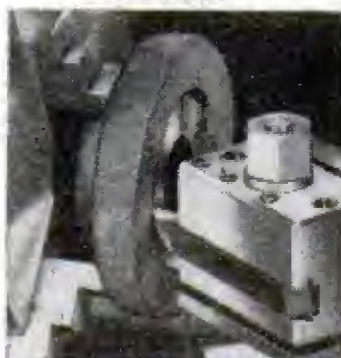
TURNING



BORING



THREADING



FACING



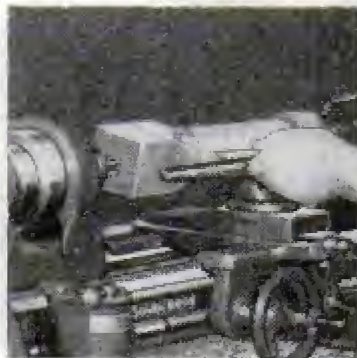
MILLING



GRINDING



TAPER TURNING



WOOD TURNING

Printed by Popular Mechanics Company, Chicago, Ill., U. S. A.

Helpful house painting hints



Before painting, nail down all loose boards, siding. Fill nail holes with putty, and let dry thoroughly before painting. Professional painters find that white lead putty gives the best results.



When painting window frames, use the correct technique. Paint sash bars first, then frames, next casings, and last the sill and apron. A shield cut out of tin, or heavy cardboard, will speed the painting.



For house painting, there's no better paint than white lead. As shown in this microphoto, white lead pigment *combines chemically* with the linseed oil vehicle. The chemical reaction helps to form a durable, *elastic* paint coat that won't get brittle, crack or scale.



And now white lead paint comes all ready to use! Eagle RTU is factory-mixed to perfect painting consistency. You just open, stir and apply. It brushes evenly and easily, making a smooth, tough coat of *whiter* white that stays white *longer* because it's pure white lead.

Eagle RTU makes any exterior paint job easier

Yes, it's true. Now you can get famed, durable, beautiful white lead paint that's all ready to use. Eagle RTU is *pure* carbonate of white lead, in *pure* linseed oil. It's carefully formulated and mixed for instant, easy use. Eagle RTU has the opacity, covering power and endurance qualities that only pure white lead paint gives—*plus* the convenience of being ready-mixed.

It's made by the Eagle-Picher Company, makers of quality white lead paint since 1843. Two forms: Primer Sealer, Outside White Finish Coat. Quarts, one, two, and five gallon cans.



EAGLE-PICHER

FREE

Hints on House Painting for Home-owners.

Eagle-Picher, Cincinnati 1, Ohio

Dear Sirs: Please send me a copy of your booklet, "Helpful Hints on House Painting."

Name

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